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NEW YORK REVIEW OF THE

TELEGRAPH AND TELEPHONE

AN ELECTRICAL JOURNAL.

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Growing Old.

At six—I well remember when—
I fancied all folks old at ten.

But when I'd turned my first decade,
Fifteen appeared more truly staid.

But when the fifteenth round I'd run,
I thought none old till twenty-one.

Then, oddly, when I'd reached that age,
I held that thirty made folks sage.

But when my thirtieth year was told,
I said: "At twoscore men grow old!"

Yet twoscore came and found me thrifty,
And so I drew the line at fifty.

But when I reached that age, I swore
None could be old until threescore!

And here I am at sixty now,
As young as when at six I trow!

'Tis true, my hair is somewhat gray,
And that I use a cane to-day;

'Tis true, these rogues about my knee
Say "Grandpa!" when they speak to me;

But, bless your soul, I'm young as when
I thought all people old at ten!

Perhaps a little wiser grown—
Perhaps some old illusions flown;

But wond'ring still, while years have rolled,
When it is that a man grows old?

The Harmonic Telegraph.

PREPARED UNDER THE DIRECTION OF MR. GRAY.

The harmonic telegraph has for its object, as is well known, the simultaneous transmission, by a single wire, of several series of electric currents, which are divided at the receiving end by apparatus of a form which permits the simultaneous reception of several dispatches. The principle of this system is as follows:

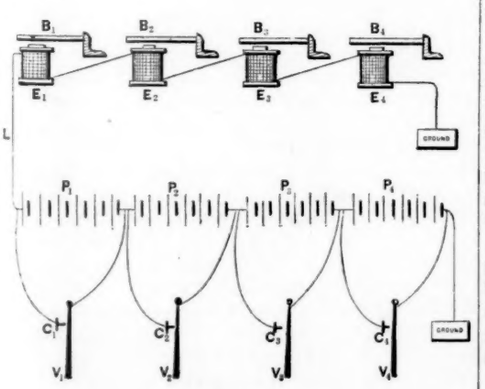

Fig. 1

A battery $P1$, $P2$, $P3$, $P4$, Fig. 1, united on one side to the ground, sends in line L an electric current which, at the receiving station, crosses seriatim a certain number of electro-magnets; four, for example, $E1$, $E2$, $E3$, $E4$. Before these latter are placed the reeds $B1$, $B2$, $B3$, $B4$, and, under the influence of the variations of the intensity of the current, each electro-magnet puts in vibration, like the diaphragm of the telephone, a corresponding reed. Further, the four reeds, fixed permanently at one of their extremities, are regulated in such a way as to give, in vibrating, four entirely distinct tones; consequently each of them is only affected by the vibrations of the current, when these variations are in accord with the number of vibrations which correspond to it.

On the other side, the battery of the sender is divided into four groups, and upon each of these groups is disposed a derived circuit, including a vibrating reed and a key for making and breaking the contact. There are thus four vibrating reeds, vibrators $V1$, $V2$, $V3$, $V4$, and four contacts, $C1$, $C2$, $C3$, $C4$. Each time that one of the vibrators touches its contact the circuit from the corresponding battery is shut off and the current is diminished; when the circuit is again cut on the current resumes its first intensity, but the vibrators set in action, each by a special magneto-electric system, are constantly driven by a determinate vibratory movement, and the number of vibrations of each of them is the same as that of one of the reeds of the receiving apparatus; that is to say, that $V1$ will have a number of vibrations equal to that of the tone which gives $B1$, $V2$, the number of vibrations corresponding to the tones of $B2$, &c. Each vibrator will determine then in the current very rapid vibrations, and will produce a series of electric waves in relation with the number of vibrations which it effects. All the vibrators being in action at the same time, there will pass, consequently, in the line four series of distinct electric waves; and each of these series of waves finding, at the receiving station, a reed in harmony with it, under its influence all the reeds, $B1$, $B2$, $B3$, and $B4$, will enter into vibrations.

If, now, one of the vibrators is stopped, the series of electric waves which correspond with it would be suppressed, and the corresponding reed ceases to vibrate. If two, three or four of the vibrators are stopped, the arrest of two, three or four of the reeds will be effected. These arrests will be heard at the receiving station; and, by making short and long stops, a sort of Morse alphabet can be arranged to transmit, simultaneously, four different dispatches.

What we have said represents, in short, the harmonic system of transmission invented by Mr. Gray; but it is evident that in practice special arrangements must necessarily be taken to assure good results. We wish now to indicate these arrangements, after having described in detail the different apparatus employed.

We will describe, in the first place, the receiving apparatus, and will indicate how, in the place of producing signals by means of stops in the sound of the receivers, these stops are transformed into electric contacts susceptible of producing ordinary electrical signals. The receiver is represented in section in Fig 2. A is the electro-magnet, above which is seen the vibrating reed of clock metal guarded by an armature of iron; the tone of this reed can be regulated by the aid of a movable weight, B, and its distance can be varied from the electro-magnet by the aid of a binding post, C c. Upon the free extremity of the reed is supported a little lever, a, balanced upon a support. To this is given the name of Rider. This rider must not vibrate in unison with the reed, and must have a fundamental tone lower than that of this last. It is supported at its lower end by a little regulating spring. The vibrating reed and the rider complete a local circuit, including a sounder and a battery. This local circuit is indicated upon one of the receivers in the diagram Fig. 5. When the reed vibrates the rider trembles constantly, and the contact between these two pieces is then so poor that the local circuit can be considered as open, and the armature of the electro-magnet can be withdrawn. When, on the contrary, the reed ceases to vibrate, the contact between it and the rider becomes good, and the armature is attracted. Subsequently, when at the transmitting station all the vibrators act upon the battery all the sounders are opened. If, on the contrary, one of the vibrators stops, the sounder of the corresponding reed is closed. The arrest of a vibrator then acts on a corresponding sounder, as that of a Morse key would act inserted with it in the circuit of a battery.

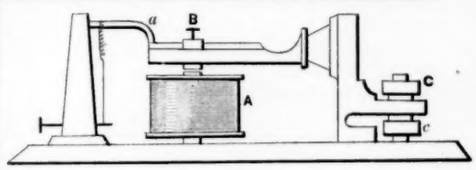

Fig. 2

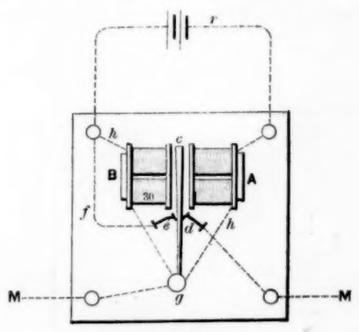

Fig. 3

The vibrator, as we have said above, is put in

movement by a special battery. It is represented by Figure 3. The electro-magnets A and B have respectively 5 and 20 ohms resistance. The current of the battery h, crossing the two electro-magnets, magnetizes them simultaneously, but on account of the greater number of convolutions, the electro-magnet B is the stronger. It attracts then the steel tongue c g fixed in g, and free at c. This tongue then touches the contact e. The current can at this moment pass by the shunt f. The electro-magnet A becomes consequently stronger, and attracts the tongue. The contact e being broken anew, B attracts in its turn g c, etc. The tongue vibrates then, and its vibration is regulated according to its fundamental tone. The contact d represents one of the contacts indicated in figure 1, by the letter C 1, C 2, C 3, C 4.

This instrument, instead of being placed as shown in Figure 3, is suspended vertically.

In the disposition of Figure 1, when the vibrator is in action by the operation of the battery which corresponds to it, it enfeebles this part of the battery in a proportion of about 60 per cent. When the vibrator is stopped, its group of battery resumes all its force, and will tend to increase the intensity of the current in the line. With four vibrators, several among them being liable to be stopped at the same time, the changes of intensity would be very considerable, and would injure the results derived from the system. In order that this latter effect may not take place, it is necessary at the same time that a vibrator be stopped, to suppress from the circuit the 60 per cent. of the group of the corresponding battery, in order to produce on the general current the same effect as the vibrator when it was in action. To attain this result, Mr. Gray, instead of stopping the vibrator by opening the local circuit, which is the idea which presents itself naturally to the mind, produces this arrest by the aid of a special disposition called the transmitter, and represented at Figure 4. The principal part of this disposition is a lever of brass A. It is terminated at one end in the form of a letter T. A spring, R, insulated by a piece of ebonite, is placed on the upper part of a lever, and a second spring, r, is in communication with the lower part. These two springs hinged at their extremities upon a branch of the T, when they are not removed from it by one or other of the regulating faces, B and S. An electro-magnet e, moved by the local battery p, and a key, k, is placed above the armature of the lever. One of the extremities of the battery is in communication with the axis O of the lever, the other with the vibrator, and also with the adjoining instrument, the spring R is united to the line, the face S communicates with the contact C, to the vibrator. Finally face B is in relation with a point of the battery dividing this battery into two parts, which should be in ratio of 60 to 40.

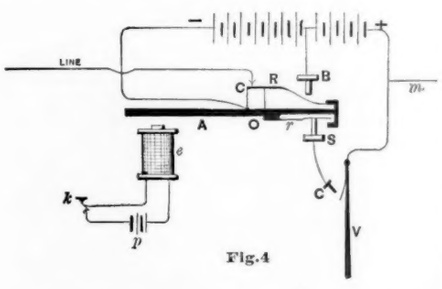

Fig.4

In the position indicated by the figure, the negative pole of the battery communicates with the line by the lever A, and the spring R; the positive pole communicates with the adjoining instrument. The contact C is thus in relation with the negative pole of the battery.

Then happens the arrangement shown in Fig. 1, and the movements of the vibrating tongue act upon the battery, to produce an undulatory current and to weaken this group about sixty per cent. It is so when the key k remains open, but when this key is closed the lower is attracted by the magnet e, the spring f abandons the face S, and the spring R is supported upon the contact B, but ceases to touch the T of the lever. The portion of the battery to the left of B is then excluded from the circuit, and it is only the portion at the right, or forty per cent. of the battery, which sends its current one way in the line by B and R and the other way in the other adjoining transmitters by m. The sum total of the current has not changed, and the closing of k has the effect simply of suppressing the series of electrical waves corresponding to the vibrator V, and consequently of stopping the corresponding vibrating reed.

It might be asked why the depression of the lever A is accomplished by the aid of a local circuit instead of being depressed directly.

The reason for this is in the fact that the pressure of the hand would be very unsteady and the contacts would be irregular; with the attraction of an electro-magnet however, on the other hand, the force producing the depression is always the same. If now the instruments are connected up in the manner described, we have the general plan shown in the left half of Figure 5.

This part constitutes the Harmonic system, properly so-called. It permits the transmission of four dispatches simultaneously, in a single direction, that is to say, from the transmitting station to the receiving station; but it is necessary that the employees of the receiving station be able to communicate with those of the transmitting station, in order to be able to respond to the calls, or to make corrections. With this end in view Mr. Gray has added to the Harmonic systems of relays, two transmitters and resistances, which, while assuring the necessary communication from the receiving station to the transmitting station, establish, besides, a fifth communication from the transmitting station to the receiving station. The relays employed are differential relays; that is to say of those upon the core of which two coils are wound in opposite directions; one M, situated at the receiving station must act under the influence of the transmitter a, situated at the other station and operated by the key k, of a local circuit; the other, N, making a part of the transmitting outfit must act under the influence of a similar transmitter, situated at the receiving station and operated by keys 1, 2, 3, 4, 5, of a local circuit.

Now let us see how the relay M can be affected by

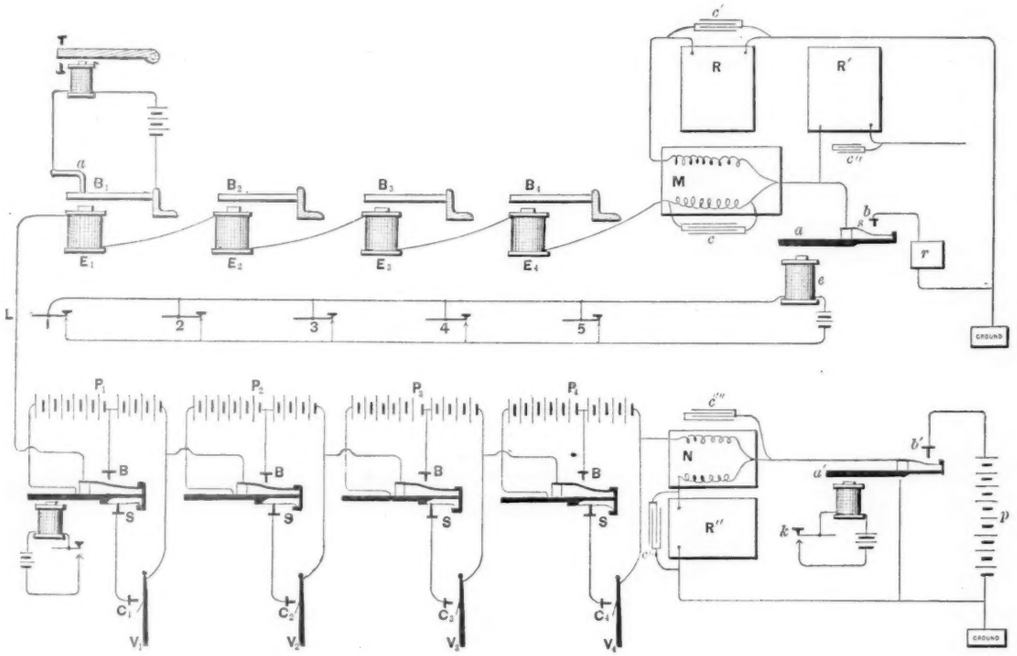

Fig.5

the transmitter a' the current on reaching the relay M across the receivers, passes at first one of its coils; from the extremity of this coil it goes to ground by two paths, following either the lever a, if it be depressed, or passing the other way if it be raised. If a be depressed there is direct communication with the ground across a nominal resistance r. The intensity of the current passing in one of the coils of the relay is then equal to the electro-motive force in play, divided by the total resistance of the line.

This intensity produces in the electro-magnet of the relay a certain attractive force, which is not quite strong enough to overcome the tension which is given to the retractile spring of the armature. This is accordingly not withdrawn. When, on the contrary a is relieved the current cannot pass from the extremity of the first coil to the ground, except by passing on one side the second coil of the relay, and the resistance R on the other side. The resistance R', R, and R', being very great, the intensity of the current is distinctly diminished; but these resistances have been calculated in such a manner that the sum of the intensities in the two coils of the relay is equal to the intensity which the current had primarily in passing through a single coil. As, by reason of the magnets being wound differentially, the action of the two coils are added together, the attractive force of the relay is still the same as in the preceding case, and the armature is not influenced while the current remains normal. In the normal condition of the current the relay M is never influenced, whatever be the position of the lever a. When, now, at the trans-

mitting station, the key *k* is depressed, an additional battery *p* is inserted in the circuit and the intensity of the current is increased. This increase determines the attraction of the armature to the relay *M* without influencing *N*. The current on reaching the relay *N* is divided between two equal resistances, that of the line and the equal resistance *R*. Two equal intensities then pass the two coils, and as the currents are then opposed their effect is destroyed and the relay *N* is crossed effectively, only by the normal current of the line, which, on account of the regulating spring of the armature, is not strong enough to influence it; but when at a receiving station the action of one of the keys 1, 2, 3, 4, 5 lowers *a* the resistances *R* and *R'* are excluded from the circuit, the intensity increased and this current which crosses only one of the coils of *N* to pass to ground, either across *a* or across *b* can then produce the attraction of the armature of *N*.

When simultaneously *a* and *a'* are depressed, it is easy to see that the two relays are affected at the same time, so that the fifth communication of the transmitter to the receiver, and the communication of service, can be accomplished at the same time.

The relay *M* sets in motion, at the receiving station, a sounder, which is used for an especial purpose. The relay *N*, on the contrary, operates at the transmitting station, five (5) sounders placed before the five (5) employees, and working at the same time. The first signals transmitted indicate to which employee the communication is addressed.

The intensity of the current can be changed within narrow limits in such a manner as to influence the relays without injuring the operation of the Harmonic system because this system depends only upon the action of undulatory currents; and, on the other hand the undulatory currents act upon the relays only as weak, constant currents. This is the reason why the two systems, super-imposed, so to speak, one upon the other, can be operated independently.

The small resistance *r*, has the effect of preventing a too sudden change of intensity, when *a* or *a'* is depressed. Condensers *c*, *c'* and *c''* are placed in derived circuit upon each resistance. They have the effect of compensating the extra currents which are produced in the coils of the resistance, and which retard the undulatory currents; in fact, they play the same *role* as in the Ruhm Korff coils. In Figure 5, the four groups of the battery are represented as being equal. In practice, they are not so. All the groups are divided by the line running to the contact surface *B*, in two parts, which stand to each other in the ratio of 60 to 40; but the absolute value of all the groups is not the same. The reason for this is in the fact, demonstrated by experience, that four undulatory currents, produced by the action of four vibrators, are not produced with equal facility. The electromotive force necessary for their production is not the same for all; hence, the necessity for making the groups of different value.

The Harmonic system of Mr. Gray has been experimented with in this country from the 22d of November, 1880, to the 22d of January, 1881, upon the lines of the Western Union between New York and Boston, over a distance of 240 miles. The trial was made under unfavorable circumstances, for the line employed was in the vicinity of other lines upon which nine quadruplex circuits were working, and the currents of these instruments created difficulties in the way of induction, in the neighboring wires, by reason of the employment of strong batteries and frequent changing of the poles of the battery.

In one of the experiments, five employees have transmitted, in the space of nine hours, 2,124 dispatches, or, 236 dispatches in all per hour, or 47 dispatches per operator per hour.

Another time, four employees, chosen among the best, transmitted in five hours 1,184 dispatches, or, 59 per employee per hour. After these experiments, the franchises required by a company which is occupied with the construction of special lines, to operate in competition with the existing telegraph companies in this country, were acquired. The Duplex, or Way Harmonic, which is a modification of the system which we have just described, is already employed on several railroads.

Telephone men, as a general thing, are opposed to the introduction of the Harmonic, on account of the induction which it occasions on all neighboring lines, and which, they think, will seriously disturb the business carried on over telephone wires. Their fears in this respect are exaggerated to a considerable extent; but there is no doubt that the introduction and the extensive use of the Harmonic system will seriously disturb the Telephone Companies, to which the wires of the Harmonic lines are approximated.

Definite arrangements have recently been made with the Governments of France and Belgium for the equipment of lines, with the Harmonic system, between Paris and Brussels. In America the system has been purchased by a new organization, which proposes to run trunk lines to all the important cities of the United States, and will use this system.

Arrangements are already made, and contracts let, for the construction of the new lines.

What Electricity May Do.

It is a trite observation that no political combination of the fifteenth century so profoundly influences the life of the present generation as the mechanical combination of type in Gutenberg's printing press. At present the application of electricity is only in its infancy, but already any one who is familiar with the dissolvent action of the steam engine, on the old order which existed a century since, can understand that the dynamo machine and the storage battery may yet effect a very unexpected transformation of the social organization, and modify or even destroy the existing balance of political forces. The political and social significance of recent discoveries in the application of electricity is increased by the disappearance of the old, unreasoning conservatism which fifty years ago formed so great an obstacle to the development of the railway system. The leader of the Conservative party is to-day driving piles in the river Lee by electricity, generated by the water wheel that to-night will light up the electric lamps which illuminate Hatfield Hall. Not only has the old prejudices against new-fangled inventions disappeared, but information is disseminated with a rapidity before unknown. Electricity, therefore, has far fewer obstacles to overcome than those which steam has vanquished; and if, as is most probable, it is destined to bring about great changes, they will be brought about with a rapidity partaking somewhat of its own character.

Last week M. Deprez succeeded in transmitting power by means of electricity through resistance representing fifty miles of ordinary telegraph wire. Hitherto it has been impossible to transmit six or eight horse power for plowing, or other heavy work, more than two or three miles. This is but an illustration of the development of the new force. It enables us to conceive the possibility—to only take one illustration—of substituting a stout cable for all the wagons and steamers employed in carrying coal from the pits to the manufacturing centers, where it is required for working machinery. But that is only a detail, and a comparatively small detail, of the change it foreshadows. Together with the discovery of the practibility of storing electrical energy to any extent, it opens up a vista of industrial revolution before which the boldest may well hold his breath. It renders possible the storage for future use of the fitful but tremendous forces of nature, which at present run to waste. The wind, the waterfall among the mountains and the tide on the shore, by the simple agency of the dynamo machine and the storage battery, may in a few years compete with the steam engine in its own field. Sir William Armstrong has long lit up his picture gallery at Rothbury by the aid of a little mountain rivulet, and Godalming has shown that a town may be lighted by the river on which it stands. "A tenth part of the tidal energy in the valley of the Severn," says Prof. Sylvanus Thompson, "would light every city, and another tenth would turn every loom, spindle and axle in Great Britain." In Ireland and in Scotland, in Wales and in some of the hilly districts in England, mountain torrents generate force which, if stored and used, would enable us to dispense with coal for all purposes except for heat, and even heat may yet be laid into our houses by wire as easily as light and force. If such a prospect is realized the whole distribution of population in Great Britain and Ireland may be altered, and electricity may far outdo the exploits of the railway in "setting towns a-dancing" all over Britain.

The consequences of such a revolution which, among other changes, might restore to the southwest the supremacy which passed to the northeast under the influence of the steam engine, would necessarily be so enormous that it is hardly worth while to allude to bills for redistributing seats in Parliament as one of the minor changes which would follow in its wake. Neither need we dwell upon the indirect result of the production of a cheap and brilliant light upon the morals of our streets—although in Boston already they declare that one electric lamp is as effective as five policemen. But there are two changes the new force is likely to produce which should be mentioned. By facilitating the distribution of force it will tend to promote decentralization, and possibly may bring about a more equal distribution of wealth. Electricity unlike steam, does not necessitate the concentration of capital. Steam blew up aristocracy, but plutocracy may be smitten by the thunderbolt. A steam engine is only potent within the range of its shafting. A dynamo machine at the nearest mill-race could work a loom in every cottage or drive a plow on the holding of every peasant. But still more remarkable is likely to be its influence in the practical realization of one of the dreams of modern socialism. No practical man believes that there is any prospect of placing the existing means of production in the hands of the representatives of the whole community. Both the surface of the land and its mineral treasures have passed irrevocably into the hands of private owners. But what promise to be the motive forces of the future belong to no man. The tides, the cataracts and the winds are the heritage of all. If they are to be utilized the public spirit of the local communities, which every day shows more impatience with existing monopolies, may be relied upon to take prompt action to prevent their exploitation for the benefit of a few. The gas and water supply are already in the hands of the municipalities. Who can calculate the results which might follow if the local authorities were also placed in possession of a motive force destined to be the main-spring of our manufacturing industry?

Insulators and Heat.—M. Lippmann having made experiments with various insulating materials, such as gum lac, gutta percha, essence of terebinth, petroleum, &c., has ascertained that bodies which act as insulators at an ordinary temperature are of no practical utility beyond a certain temperature. In his experiments he placed the insulating bodies between two plates of platinum in the same circuit as one of his capillary electrometers, and a battery of 1 to 40 cells. At an ordinary temperature the electrometer was not affected, but at higher temperatures, not, however, exceeding 100, the mercury in the electrometer gave evidence of the passage of a current. On being cooled again the bodies became good insulators.

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At the meeting of the Bankers' and Merchants' Telegraph Company, held to-day, the following officers and directors were elected: William W. Maris, President; A. W. Dimock, Vice-President; J. Heron Crosman, Treasurer; J. V. Bouvier, H. W. Biddle, John Marko, W. W. Kurtz, A. H. De Haven, G. S. Mott, Directors, and J. G. Case, Secretary.

The Bell Telephone Co., of Philadelphia, are about removing their operating and executive offices to the large new building corner Fourth and Chesnut streets.

Mr. W. D. Sargent, the General Superintendent, has recently made a tour of inspection through the large exchanges of the country to see the operation of the various exchange systems. We learn that he is favorably impressed with the duplicate system as it is in operation at Indianapolis, Ind., Columbus and Toledo, O., and is thinking of adopting that system in Philadelphia when the exchange is removed to its new quarters.

The Efficiency of the Metallic Circuit as a Means of Diminishing Telephonic Disturbances.

When the telephone was first brought forward, claiming the acknowledgment of the American public, it was largely put into use upon pre-existing telegraph lines, and of course could only be used when the line was at rest, at least so far as the key and relay were concerned.

This was evident to all, because when the key was operated, the rapidly succeeding breaks and makes of the circuit were all loudly reproduced by the sensitive magnet and diaphragm of the telephone, and the telephone proved at once its ability to act, if necessary, the part of a Morse sounder. But it became quickly manifest that even when the line was in a quiescent condition, the telephone was energized by some unseen force, and was so excessively anxious to work, that all kinds of rappings and noises, scratchings, screechings, and buzzing noises were continually heard, varying in intensity with the time of the day.

One radical defect was thus made known, and was found to exist in quite a number of old, and supposedly first-class lines; that was defective joints. The peculiar rasp caused in a telephone by a bad joint soon becomes known by an expert, and sounds substantially like that caused by separating the contact points of a Blake transmitter.

This trouble could, of course, be obviated by improved line construction, and when lines were constructed specially for the telephone, they doubtless were improved, at least while they were new.

But there was a persistent buzz, which was very difficult to account for, and which was therefore classed under the generic name of induction, and which we have heard graphically described by a Gold and Stock inspector as "running to unison."

Those who have noticed the peculiar restful click of a stock-printing ticker, will at once recognize the likeness.

Considering that these noises were caused by induction currents, at least two electricians, Messrs. Brooks and Bell, conceived the idea that building the line in metallic circuit, with the two wires of the circuit parallel to one another, would radically remedy the trouble. Both gentlemen applied for a patent, which after considerable delay in the Patent Office was awarded to Mr. Brooks.

It has been discovered subsequently that the same contrivance was, over twenty years ago, devised and patented by Werner Siemens, in England, for the same purpose, namely the elimination of inductive disturbances between parallel circuits.

This invention has been put into practical shape in several ways, and by several inventors, and is certainly as completely a quietus upon the noises in question as can well be.

But it is very difficult of application; it will be seen that it is all right as long as we have but one line, but when that line is connected with another line for through communication, the other line must be a metallic circuit too, or the two parallel lines of the first are transformed from a two conductor metallic circuit to a single conductor of large cross section. To meet this difficulty, it has been proposed among other plans to use at the junction point an induction coil, one circuit of which shall form a part of line No. 1, and the other, or secondary coil, must form a part of coil No. 2, the coil, of course, being transferable from one pair of circuits to another at will.

There is much room for invention in this line, and we present the problem to our readers, as it stands at the present day, promising them such developments, as shall from time to time be brought forward.

THE PLANTÉ BATTERY FOR ELECTRIC LIGHT PURPOSES.—The most promising of the recent inventions in electric lighting, so far as its application to illuminating underground workings, particularly in collieries, is concerned, is the secondary battery, with the aid of which portable electric lights may be obtained. A commission of eminent French scientists has communicated to the Academy of Sciences, through M. Tresca, the result of some experiments as to the efficiency of the Planté battery as applied to electric lighting. The object of these experiments was to measure the power consumed in charging the battery and the energy returned in lighting eleven Maxim lamps. The trials lasted 108 hours. It took 9,569,800 kilogrammètres to charge the battery with 6,945,000 kilogrammètres, and the work returned was 3,809,000 kilogrammètres, or 60 per cent. of what had been stored in the battery.

Medical Electricity.

The subject of electricity applied to curative purposes is one which seldom comes before a learned body for serious discussion; nevertheless, the time is at hand when that somewhat invidious branch of medical science should emerge from the cloud of mingled obscurity and charlatanism which has so long surrounded it. There can be no doubt but that some remarkable cures have been effected by the electrical current. The pangs of rheumatism, neuralgia, and other muscular and nervous disorders have been dispelled by electrical stimulation, and watery tumors, congestions, and other morbid growths reduced

THE ELECTRIC CONDUCTIVITY OF PHOSPHOR-BRONZE.—H. Vivarez, of Paris, has made a very elaborate series of experiments on the electric conductivity of phosphor-bronze wire, from which it appears that its conductivity is two and a half times that of iron and steel, and one-third that of copper. As its strength is equal to that of steel, about sixty-three tons per square inch, it is recommended for telephone wires, for which purpose it is largely used in Austria.

The Telephone is utilized in Colorado and New Mexico in many instances to unite the widely separated ranches of the large herdsmen, saving them many miles of travel each day.

The gross receipts of the American Patent Office for the year 1881 were $853,565.89; the gross expenditure was $605,173.28, leaving a net profit of $248,492.51.

The Lytle Aerial Cable.

Every telephone exchange manager knows that after he gets a thousand line wires into one office it becomes a problem how to run them so as to keep clear of one another, and also to afford room for more; in fact the problem doesn't always wait for a thousand wires, but comes on us "prematoorly," as A. Ward used to say.

Every telephonic eye turns to the ærial cable as the way out; for any method whereby we may bring a hundred wires into an exchange, in as small a space as we heretofore used for only one, and which presents in addition an almost perfect immunity from trouble, is a public benefit and must be necessarily so regarded.

One of the finest cables, designed for such use, is one manufactured by Eugene F. Phillips, of Providence.

In consideration of valuable assistance, and information rendered, and of several practical ideas which are embodied in this cable by Mr. H. B. Lytle, of the Boston Telephone Dispatch Company, the cable has been named by Mr. Phillips the "Lytle Cable."

Its construction is peculiar, and great care is taken to secure a high standard of electrical and mechanical perfection in each individual conductor, as the best method of producing a high-class cable in the aggregate.

A cable of this character has been made by Mr. Phillips for the Boston company, and has for some time been suspended between the central office, at 40 Pearl street and the United States Hotel, from which point the individual lines are fanned out in different directions.

The entire length is 2,364 feet, and as a non-interfering cable it is a success, while no retardation is perceptible.

In this cable there are fifty-one conductors, each of No. 20 copper, double wound with cotton and paraffined.

Each conductor so covered is then separately covered with rubber, and by a special process the conductor is kept always in the center of the rubber.

Thus perfect insulation is provided for. Over the rubber of each conductor is then lapped a metallic coating, usually tin foil; this, of course, for the purpose of acting as a conducting surface for induced currents. All the tin-foiled conductors are then bunched together, so that all the tin-foil conductors are in contact with one another, and then an outer coating of rubber is placed over all, which, besides improving the total insulation, holds all the conductors firmly together.

Over this again is woven tightly a covering of stout hose, which is tarred or otherwise made waterproof, the whole forming a magnificent electric cable for ærial lines. In practice, the tin foils must of course be connected at each end, and at as many intermediate points as may be necessary with the earth, while lightning arresters must of course be also applied, certainly at each end, and preferably also in the middle of a mile cable, the cable being divided and fanned out for that purpose.

These cables can be made of any size or required number of conductors, from ten to one hundred; and a hundred-wire cable is only an inch and a quarter in diameter.

In many cases such a cable need not have every conductor tinfoiled, as it is perfectly obvious that those conductors which are surrounded on all sides by others are just as well protected as though they were tinfoiled themselves.

The Lytle cable is a step ahead, and only requires to be known to be appreciated.

The Savings Banks of New York State report deposits amounting to $443,000,000.

A New Method of Insulating Electric Light Wires.—Mr. P. B. Delaney, of this city, has, at a recent meeting of the Franklin Institute at Philadelphia, shown a novel plan of insulating electric light wires by means of a series of porcelain buttons, making a flexible and indestructible insulating covering for the wires. The buttons are made of sizes to correspond to the size of wire or wires to be covered, and are pierced with as many openings as there are wires to be strung upon one line. This mode of button insulation is intended for heavy as well as for light wires. Where the wires run indoors, no further protection than the porcelain buttons is considered necessary; where the line is carried underground, it is recommended to carry in a metallic pipe and to fill the vacant space by forcing in some plastic composition like asphaltum.

Underground Electric Wires.

THE PECULIAR SENSITIVENESS OF TELEPHONE CONDUCTORS—TESTIMONY BY EXPERTS.

The special sub-committee to enquire as to the practicability of laying telegraph wires underground met at the Metropolitan Hotel. Senator Daly, whose bill caused the appointment of the committee, was in the chair, and the other two members, Senators Lansing and Covert, were present.

Robert Brown, an expert, said that while he was in favor of laying telegraph wires underground, he doubted the feasibility of burying telephone wires, He said that unless a metallic circuit or double wire was used it would be impossible to make the telephone successful. His son, who is an electric engineer in Paris, was obliged to use the metallic circuit. He didn't know any reason why the electric light wires should not be buried. He had run telegraphic and electric light wires side by side without any difficulty.

Henry W. Pope, general manager of the American District Telegraph Company, said that he believed the laying of all wires underground was feasible. The induction effect could be overcome both by the metallic envelope and the twin wire connected with the earth.

"Suppose you send a message from the central office in New York," he was asked, "to Chicago, and it passes underground through the limits of all the cities between this city and Chicago, what effect would it have?"

"You would not notice any effect," he replied.

He then qualified his statement by placing a limit of five miles on the extent to which the wires should be buried. He urged that if the wires were to be put underground it should all be done by an independent company, as in Boston, so as to avoid complications. The objections to burying the wires were induction and expense. The difficulty was much greater with telephone than with telegraph wires. There is one buried cable of less than an inch in diameter in New York which contains eighty wires. They carry wires below the surface in all the prominent cities of Europe. In London and Paris, however, there are only one-eighth as many wires as in New York.

Geo. S. Evans, Superintendent of the Lugo-dynamo Electric Company, told of the conduit, one mile long, in Market Street, Philadelphia, in which are telegraph, telephone and electric light wires. He pronounced it highly successful.

J. W. Barrow, an amateur, who had watched the Philadelphia experiment closely, also commended it.

F. L. Pope, expert, said he had no doubt that the wires could be worked underground. It was only a question of expense.

Thomas A. Edison said that he had made a special study of the subject, and thought it entirely practicable, both scientifically and commercially, to lay wires underground for all electrical uses. The massing of wires together under ground would increase induction if ground circuits were used, but not with metallic circuits. He said that the laying of wires underground was merely a question of expense, and that in five or six years the first outlay would be made up in savings in repairs and maintenance account.

David Brooks said he was at present laying under ground wires between Jersey City and Newark for the Western Union Telegraph Company. He had had experience in that matter in London, Paris, Berlin, Brussels, Antwerp, and other European cities. The number of underground wires in England was limited. No poles or aerial wires were allowed in the finer portions of Paris. The wires were inclosed in lead pipes, fastened to the sides of the sewers, and were easily accessible. The telephones worked better than those in this city, because a metallic circuit was used. Few telephones were used in Paris in comparison with the number in use here. Germany had more telegraph wires than all the cities in the world put together. In Vienna, in 1873, the wires were carried on iron poles. In 1874 they were taken down. The wires were brought along the quays, and a great number of underground cables laid. Mr. Brooks thought all the wires now on poles in New York city could be put underground in a year. Three times as many wires as are up now could be put in a very small space underground. Mr. Brooks said he thought the electric light wires very dangerous above ground.

Charles A. Cheever, President of the Jablochkoff Electric Light Company, thought the underground system feasible. Nearly all poles could be removed from the streets. The housetop system would have to be combined. A number of electricians testified that the underground system was practicable. Finally Mr. D'Infreville, electrician of the Western Union, said that the company was examining constantly the underground systems presented by inventors. He had been sent to Paris last year to thoroughly investigate the matter. The company had been using underground wires from the main building to Pier 18, connecting with the cable to Jersey City. Two pipes, one containing sixty and the other thirty wires, were used. Eight months ago they gave out suddenly, and it would have taken several days to have found where the fault was. The company was waiting for Mr. Brooks to lay wires between Jersey City and Newark, so they could test the underground system. If the system was successful the company would support it. He believed a reduction of speed in the transmission of messages would be one of the results of the underground system.

Mr. George d'Infreville, electrician of the Western Union Telegraph Company, testified also before the legislative committee appointed to inquire into the practicability of laying telegraph wires underground, that he believed phosphor-bronze wire would soon replace the heavy telegraph wires now in use. These wires are so thin as hardly to be visible, and need to be supported only at long intervals. The great danger to be apprehended from wires enclosed in gutta percha under ground was the heat of steam pipes. He thought all the underground systems was merely experimental.

Mr. David Brooks was questioned by L. E. Chittenden in regard to his system of laying wires under ground, in which the Western Union holds the largest interest. He said that all the wires in the city could be put under ground in two years.

Charles E. Chinnock, electrician of the Metropolitan Telegraph and Telephone Company, thought that only two miles of telephone wire would work well under ground.

The Electric Light and Insurance.

The following regulations for the use of electric lighting apparatus have been published by the Boston Manufacturers' Mutual Fire Insurance Company, as the conditions on which it will write risks. These regulations were prepared by Mr. C. J. H. Woodbury, a gentleman who has given extended thought to the investigation of the causes and means of prevention of mill fires:

Dynamo machines should be located in dry places, not exposed to flyings or easily combustible material, and insulated upon wood foundations. They must be provided with devices capable of controlling any changes in the quantity of the current; and, if these governors are not automatic, a competent person must be in attendance, near the machine, whenever it is in operation.

Each machine should be used with complete wire circuit, and connection of wires with pipes, or the use of ground circuits in any other method is absolutely prohibited.

The whole system should be kept insulated, and tested every day for ground connections at ample time before lighting, to remedy faults of insulation, if any are discovered.

Preference is given for switches constructed with a lapping connection, so that no electric arc can be formed at the switch when it is changed; otherwise, the stands of switches, where powerful currents are used, should be made of stoneware, glass, slate, or some incombustible substance, which will withstand the heat of the arc when the switch is changed.

Any conducting wire which is warm to the touch, in comparison with another wire, is liable to become a source of danger, and should be replaced by a larger wire. Conducting wires should be secured to insulating fastenings, and covered by an insulation which is waterproof on the outside. Whenever wires pass through walls, roof, floors or partitions, or where there is a liability to abrasion, or exposure to rats and mice, the insulation should be protected with lead, hard rubber, stoneware or some other satisfactory material.

Joints in wires should be securely made and wrapped; soldered joints are desirable, but not essential.

Wires should not approach each other nearer than one foot, and twice that distance is preferable in conducting electricity of high tension. Care should be taken that wires are not placed above each other in such a manner that water would be liable to make a cross connection.

The chances of a broken wire should be everywhere provided against by securing the wires on suitable insulators; avoiding danger from an accumulation of lint, by placing them from one-eighth to one-quarter of an inch from the walls, ceilings or beams, except where necessary to lead to the lamps, and in all cases avoiding loops of wire, or leading it across the space from beam to beam.

A cut-out should be placed in the circuit outside of each building, in a well protected and accessible place.

The lamp frames and other exposed parts of lamps should be insulated from the circuit. Each lamp should be provided with a separate hand switch; and also with an automatic switch which will close the circuit, and put the lamp out whenever the carbons do not approach each other, or the resistance of the lamp becomes excessive from any cause.

The light should be surrounded by a globe, and, when near combustible material, this globe should be protected by a wire netting. The globe should rest in a tight stand, so that no particles of melted copper or heated carbon can escape. Broken or cracked globes should be replaced immediately. Unless the globe is very high, and closes in as far as possible at the top, it should be covered by some protector, reaching to a safe distance above the light. Flat sheets of metal or wire gauze should not be used for this purpose, because flyings will collect upon such places when the lamps are not in use.

The lamps should be provided with some arrangement or device to prevent the lower carbons from falling out, in case the clamp should not hold them securely.

The small wires leading to each lamp from the main wires should be very perfectly insulated, and, if separated or broken, no attempt should be made to join them while the current is in the main wires.

The conducting wires leading to each building should be provided with an automatic switch or cut-out, or its equivalent, capable of protecting the system from any injury from an excessive current of electricity.

The Electrical Resistance of Carbon under Pressure.

I am indebted to Mr. Herbert Tomlinson for drawing my attention to his most interesting comparisons between the behavior of carbon and of metals in respect of change of electrical resistance under mechanical stress, and am glad to see that his delicate determinations entirely support my conclusion that the excessively slight change of specific conductivity produced by stress in hard coke carbon cannot possibly explain the great variations of resistance observed in the carbon telephone, carbon rheostat, etc. I have also learned that a similar conclusion was arrived at some time ago by Professors Naccari and Pagliani, and that some experiments made by Professor W. F. Barrett, of Dublin on the bottoms of compressed lamp-black prepared in Edison's laboratory for use in his well-known carbon telephone lead to a precisely similar result. I am therefore perfectly willing to admit that before the publication of my experiments this question was virtually settled. It is quite clear that the carbon telephone does not work by any variation in the specific resistance of the carbon, but by the partial opening and closing of the circuit at certain surfaces where the intimacy of the contact can be varied by the vibrations.

SYLVANUS B. THOMPSON.

Cost of Incandescent Lamps.

Mr. Swan, the inventor of an incandescent electric lamp very similar to Mr. Edison's light, recently gave some particulars before the London Royal Institution as to the comparative cost of incandescent lights and gas. He said the cost of light by electric incandescence might be compared with the cost of gas light in this way: two hundredweight of coal produced 1,000 cubic feet of gas, and this quantity of gas, of the quality called fifteen-candle gas, would produce 3,000 candle light for one hour. But besides the product of gas, the coal yielded certain by-products of almost equal value. He would therefore take it that they had in effect 1,000 feet of gas from one hundred weight of coal, instead of from two, as was actually the case. The one hundredweight of coal would give fifty horse power for one hour. Experiments show that they could obtain through the medium of incandescent lamps at least 200 candle light per horse power per hour. But as there was waste in the conversion of motive power into electricity, and also in the conducting wires, he made a liberal deduction of 25 per cent., and took only 150 candle light as the net available power of one horse power. For fifty horse power, the product of one hundredweight of coal, they had then 7,500 candle light as against 3,000 candle light from 1,000 feet of gas. There remained, however, an allowance to be made to cover the cost of the renewal of lamps. Whether by the method of multiple arc, which required the multiplication of electrical stations, or by means of the simple series, or of secondary batteries connected with each other from house to house in single series, the lamps being fed from these in multiple arc, he was satisfied that comparatively with the distribution of gas, the distribution of electricity was sufficiently economical to permit of its practical application on a large scale.

The Future of Electricity.

The following is an extract from a pamphlet recently published in Paris on the application of electricity to agriculture, by Mr. J. A. Barral, Secretary of the National Agricultural Society of France:

"There will be applications of electricity as of steam. Thirty years ago, returning from England, where I had witnessed the first employment of steam on the farm, I said that this was the beginning of a reform in agriculture. I met only with incredulity, sneers, and expressions of pity for my impracticable views. To-day, as you all know, steam is everywhere, even in the meanest hamlets; it traverses our country roads to the great benefit of every farmer; the traction engines constructed for use in agriculture, are utilized for other industries, and their use is becoming more extended from day to day. I expect that within thirty years a no less marvellous revolution will have been effected by electricity."

Electrical Thermometer and the Vertical Decrement of Temperature.

The council of the Meteorological Society, in experimenting on the vertical decrement of temperature, have placed thermometers at the summit and base of Boston Church Tower, which is 270 feet high. This tower is admirably situated for making such experiments, as it is isolated and free from any obstructions and the ground is quite flat for miles around. By permission of the vicar, Canon Blenkin, the instruments have been placed as follows: at the summit, one of Dr. Siemens' electrical thermometers (kindly placed at the society's disposal by Messrs. Siemens Bros. & Co.) and an ordinary thermometer are mounted in a small screen fixed to one of the pinnacles of the tower; on the roof of the belfry, which is 170 feet above the ground, a Stevenson screen has been mounted containing maximum, minimum, dry and wet bulb thermometers. In the churchyard, another Stevenson screen has been fixed, containing a similar set of thermometers for comparison with those above. All the thermometers will be read every morning at nine o'clock. The electrical thermometer consists of a coil of wire wound round a cylindrical piece of wood inclosed in a small brass tube; a third wire is joined to one of the wires, and the three insulated by gutta-percha, from a light cable which is brought down to the base of the tower and connected to a galvanometer, the terminals of which are in connection with the two poles of a six-cell Leclanche galvanic battery. The instrument is read by depressing a key which causes the needle of the galvanometer to deflect; a pointer or vernier (moving a contact roller upon a wire in a circular groove) is then pushed to the right or to the left upon a divided scale, until the needle remains stationary on the zero point, when the electrical resistance of the wire is measured upon the scale. The number indicated by the vernier is then read off, and by referring to a table of equivalents, the actual temperature in degrees of Fahrenheit is readily ascertained. Simultaneous readings of the electrical thermometer at the summit of the tower and of the dry bulb thermometer in the churchyard will be made frequently during the day.

The Bank of Montreal has capital surplus of nearly $19,000,000, with assets amounting to a total of over $45,000,000, and with deposits over $20,000,000.

Recently on the Rudolph Railroad in Austria experiments were made with an electric head-light for locomotives. The motive power for the electrical machine is obtained from a small engine which is mounted on the boiler and receives steam from it. The electric lamp is placed near the smoke-box door and can be turned on a pivot by the engineman from the foot-board in order to direct the light in any desired direction. Some early experiments with a locomotive electric light failed, but later ones with a lamp constructed by the engineer Sedlaczek are said to have succeed completely. The light is said to have been uniform and illuminated the track perfectly for 1,300 ft. to 1,600 ft. in advance on straight lines, and, by turning the lamp, for more than 600 ft. on curves. There was a long tunnel on the line where the experiments were made, and an opportunity was offered to see its value in examining such a work. The distinctness with which signals, and especially the colors, could be seen for great distances was striking, and it made it possible to observe the position of every switch on entering a station.

ELECTRIC LIGHTING IN INDIA.—The municipalities in India seem to be taking kindly to electric lighting, and even thus early the Eastern Electric Light and Power Company have entered into a contract to supply both arc and incandescent lighting for the public streets of Broach under the Brush system. Negotiations are also pending with a number of other cities, including Bombay, where in the Crawford Market the company, by arrangement with the municipal authorities, are erecting an experimental display.

ELECTRICAL APPARATUS ON FRENCH RAILWAYS.—According to the Paris correspondent of the *Standard* of the 14th inst., the Eastern Railway Company recently made trial of a train equipped with the most recent and improved electrical apparatus which ran from Paris to Gretz. "The carriages were connected by electric communications, the brakes acted by electricity, and all the compartments of the thirteen carriages composing the train were lighted by electric lamps. The results of the experiments were completely satisfactory."

ELECTRIC LAMP.—Mr. Edison has recently patented an arc-lamp which avoids the unsteadiness arising from impurity of the carbon. It occurred to Mr. Edison while conversing with a friend in New York that this result might be achieved by causing the upper carbon to revolve rapidly. He tested the idea at Menlo Park, using at first a hand-wheel, and, finding this successful, he has fitted into his new lamp a small electro-motor, which makes the "candle" revolve at the rate of 3,000 revolutions a minute, and this, it is stated, insures absolute equality. The current is thus made to perform a threefold duty—to supply the light, to turn the electromagnet, and to form the arc. This new lamp has not yet been seen in England, and it is uncertain whether it will be shown at the Electric Exhibition now being held.

In the Five-Millionth Part of a Second;

It is a curious fact that photographers, who of all others are most dependent upon clear weather for their operations, are now enabled to defy both fog and night—at least so far as their sitters are concerned. At a recent demonstration at the rooms of the Society of Arts, several pictures were successfully taken by artificial light; while Capt. Abney, who is now delivering a series of Cantor lectures upon Photography, obtained an image on a sensitive gelatine plate by the illumination afforded by the spark from a Leyden battery. The actual duration of the light so obtained he estimated at the five-millionth part of a second.

A WORD FOR THE ELECTRIC LIGHT.—Mr. Wakefield, at a meeting of the Barnet District Gas Company, speaking of the electric light at the Alhambra Theater, of which he was a director, said he could tell them to a half-penny what the light cost and what its results were. He was bound to say that the light there was considered a success. They had had to make some alterations, and had put up an engine at a cost of £500; but the electric lighting certainly saved them from eight to ten pounds a weeek, and provided equally good illumination.

La Lumiere Electrique (Paris, February 18), reproduces a note on electrical transmission of force to great distances, presented by M. Marcel Deprez to the Academy of Sciences. With small Gramme machines, weighing about 2 cwt., M. Deprez states that he has obtained an available power of 37 kilogrammeters, the resistance between the motor and the receiver being 786 ohms, representing a distance of 78.6 kilometers of ordinary telegraph wire.

A NEW APPLICATION FOR THE FAURE BATTERY.—Recently a horse-car was run in England by means of the Faure accumulator and a dynamo machine connected by cog-wheels and gearing to the wheels. The distance traversed was about 2½ miles. The dead-weight of the car was 5¼ tons, the speed reached seven miles an hour, although the car was not of the most advantageous build for the purposes of the experiment. The experiment was successful, stopping and starting the car being effected with great promptitude.

TELEPHONES IN SOUTH AMERICA.—Buenos Ayres, the wealthy center of the River Plate trade, is already surpassing many large commercial towns in Europe in its use of the telephone. The Pantelephone Company (System L. de Locht), formed some months ago, has proved a great success, having already over 600 subscribers, 200 of whom are in communication, the remainder to be brought in in a few weeks, as the works are farther advanced. This company has fifteen offices, where the public can not only speak but also hand in written messages.

On Electric Shadows.

By P. Riess.—Signor A. Righi, of Bologna, has published an essay on this subject. He has not observed the luminosity of an electrified surface when an electric current of air falls upon it, but merely the dust figures formed by this air-current. He has thus failed to recognize the important discovery made by Holtz that a narrow body placed in the air-current throws a shadow upon the luminous surface when such body is a conductor of electricity. Hence it must be concluded that a part of the air-current is discharged by an intervening conductor, whilst by a non-conductor it is merely driven out of its position. As in the latter case the entire air-current remains electric, its diverted portion will be drawn back by the non-diverted portion to its former position, and impinge upon the luminous surface at the same place as if the intermediate body were absent. A slender cross of vulcanite projects a shadow upon the luminous plane only if breathed upon. This beautiful experiment shows in the simplest manner that an electrified surface in the free air is luminous only in parts where it comes in contact with an air-current charged with the opposite electricity.

Edison's Light in Berlin.

The National Bank has concluded a preliminary contract with Mr. Edison for illuminating public buildings with his electric light.

Lectures at the Crystal Palace.

FOURTH LECTURE.

The last lecture of this course on electric incandescent lamps suitable for domestic lighting was delivered in the concert room of the Crystal Palace, on Wednesday evening, by Professor Sylvanus P. Thompson, of the University College, Bristol. So far back as 1841 the attempt had been made to construct little electric lamps by enclosing in glass bulbs thin wires of platinum or thin strips of carbon which on the passage of an electric current grew white hot. This method of procuring light from electric currents was revived in 1878 by Mr. Edison, who at first attempted to construct platinum lamps, which, however, in spite of many ingenious contrivances to protect them from overheating, could not be kept from fusing up. Eventually Edison settled upon a filament of carbon, but not before a similar suggestion had been made by Mr. Swan, of Newcastle. Edison prepared his filaments from bamboo fibre, Swan from cotton thread. In each case the carbonized fibre was fixed in a small pear-shaped globe, and exhausted as perfectly as possible of air by a mercurial air-pump. A filament of carbon thus treated became as elastic as steel. Similar lamps had been constructed by Lane-Fox and by Maxim, with slight differences of detail in the manufacture. These little lamps gave a light of about equal brightness to one bright gas jet. They were destined to work a revolution in domestic lighting, since when supplied by currents from a central station they would not only be cheaper than gas, but would be far more readily managed and kept in order. There was no unhealthy smoke or products of combustion produced, very little heat, no smell and no risk of explosion. The incandescent lamps lent themselves with extraordinary facility to the purpose of decoration, and would doubtless rapidly become the fashionable mode of lighting. The experience of the Savoy Theatre showed that it was practicable to apply them to a large building. The public safety demanded that no time be lost in making electric lighting imperative in all theatres and public buildings. It ought also to be made compulsory to use electric lamps in coal mines. In a few days the experiment would be tried of lighting the Holborn Viaduct and surrounding houses by Edison's lamps from a central station. This would be but a small sample of the method in which domestic electric lighting could be carried out on a large scale. The lecturer predicted for this method of lighting, results far more important and wide-reaching than those which any other kind of electric lighting could possibly attain.

Telegraph Patent.

A patent has just been granted for a main line sounder, an instrument to be used on telegraph lines, which, it is claimed, will revolutionize the present method of receiving signals by a relay sounder and local battery. Aside from this important factor of economy, this invention is admitted to be entirely outside the scope of the celebrated Page patent, which practically controls the whole field of telegraphy. Tests have been made between Washington and New York, Washington and Cincinnati and other distant points, in the presence of patent office and other electrical experts, which demonstrated that this invention accomplishes that which has been heretofore claimed by electricians as impossible.

Land Grants.

It seems that only 137,881,000 acres have been transferred in land grants to railroads—an area about five times the size of New York State. And yet it is said republics are not generous.

Government Lectures at Washington.

As the Government of the United States has no other business of sufficient importance on hand at present, it is proposed that it shall furnish free lectures to the people.

A bill whose purpose is "to provide the best instruction in the arts and sciences which especially relate to the development of the material resources of the country and to the increase of the comforts and conveniences of life among the people," has been introduced into the House of Representatives by Mr. KELLEY, and has been referred to the Committee on Education and Labor.

This bill directs that annual courses of lectures shall be delivered in the city of Washington, upon the arts and sciences illustrated in the National Museum.

The lecturers are to be employed by a Board of Managers consisting of the Secretary of the Smithsonian Institution and other officers of the Government, whose functions are chiefly of a scientific character.

Sixteen topics are enumerated in the bill as those which "shall be first treated in the lecture courses." These are mining and metallurgy, applied chemistry, agriculture and horticulture, veterinary science, mechanical engineering, fish culture, entomology, microscopy, electricity, forestry, architecture, navigation and shipbuilding, meteorology, botany, anatomy and physiology, and geology and mineralogy.

We would suggest an additional course on spelling, for American diplomatists, and another on common sense in Congressmen, specially discussing the rarity and value of that great gift.

For the lectures thus provided "no fee shall be charged to any one, except for certificate of attendance and proficiency as may be desired by any person."

This exception is significant. Note, also, that the Board of Managers is to be a corporation with power to acquire, hold and convey property in any portion of the United States, and to appoint such executive officers and agents as may be necessary, as well as to employ the lecturers.

Plainly, we have here nothing less than a scheme to organize an institution which will develop into a national university.

At the very outset there will be the corporation, the courses of instruction, the instructors and the degrees—for the certificates of attendance and proficiency mean degrees—of a university. None of the essentials will be wanting, and the name can be supplied hereafter.

This measure, therefore, should be discussed and adopted or rejected with a clear understanding of what it really is. It is a bill for the establishment of a national university.

Longevity.

WHAT IS THE EXTREME LIMIT OF HUMAN LIFE?

Can man reach and pass the age of a hundred years? is a question concerning which physiologists have different opinions. Buffon was the first one in France to raise the question of the extreme limit of life. In his opinion, man, becoming adult at 16, ought to live to six times that age, or to 96 years. Having been called upon to account for the phenominal ages attributed by the Bible to the patriarchs, he risked the following as an explanation: "Before the flood the earth was less solid, less compact than it is now. The law of gravitation had acted for only a little time; the productions of the globe had less consistency, and the body of man, being more supple, was more susceptible of extension. Being able to grow for a longer time, it should, in consequence, live for a longer time than now."

The German Heusler has suggested on the same point that the ancients did not divide time as we do. Previous to the age of Abraham, the year, among some people of the East, was only three months, or a season; so that they had a year of spring, one of summer, one of fall and one winter. The year was extended so as to extend eight months after Abraham and of twelve months after Joseph. Voltaire rejected the longevity assigned to the patriarchs of the Bible, but accepted without question the stories of the great ages attained by some men in India, where, he says, "it is not rare to see old men of 120 years." The eminent French physiologist, Flourens, fixing the complete development of man at 20 years, teaches that he should live five times as long as it takes him to become an adult. According to this author, the moment of a completed development may be recognized by the fact of the junction of the bones with their apopyses. This junction takes place in horses at five years, and the horse does not live beyond 25 years; with the ox at four years, and it does not live over 20 years; with a cat at eighteen months, and that animal rarely lives over ten years. When it is effected at twenty years, he only exceptionally lives beyond 100 years. The same physiologist admits, however, that human life may be exceptionally prolonged under certain conditions of comfort, sobriety, freedom from care, regularity of habits, and observance of the rules of hygiene; and he terminates his interesting study of the last point ("*De la Longevite humaine*") with the aphorism, "Man kills himself rather than dies."

Four-Track Railroad 300 Miles Long.

The four-track line of the New York Central is now complete from Albany to Buffalo, 298 miles. When the two additional tracks were first constructed they extended from Albany to Rochester, 250 miles. West of Rochester the company had a double track to Suspension Bridge, by which it received nearly all the immense Michigan Central traffic, and another to Buffalo, so that it had four tracks from the Niagara River to the Hudson River; but west of Rochester, of course, the tracks had to be used by both freight and passenger trains. It is a striking commentary on the vastness of the traffic on this road that it has been found advisible to increase the capacity above that afforded by the two double-track lines. In addition it has been building a yard for through cars at East Buffalo, which will hold more cars than anything else of the kind in this country, and perhaps in the world. It is hard to say what the road as it is now, worked to its full capacity, would not be able to carry. Certainly it must take a tremendous traffic to choke it; lack of rolling stock may prevent its carrying all the traffic that offers, at times, but traffic will probably have to grow a long time before there is any difficulty in finding room for all the trains there is occasion to run over the six tracks between Rochester and the Niagara River. There is nothing like this four-track road from Albany to Buffalo anywhere else in the world. There are short sections of four-track road on several lines, and the London and Northwestern expects to be compelled to have separate freight and passenger tracks for a considerable portion of its road, we believe; but nowhere else in the world can be found a continuous four-track line 300 miles long.

A Magnanimous Gift.

President Moses Taylor, of the City National Bank, who has been identified with the Delaware, Lackawanna and Western Railroad Company from its inception, has endowed a hospital for the disabled employes of that company, and those of the Lackawanna Coal and Iron Company. Mr. Taylor's endowment consists of $250,000 par value of the bonds of the New York, Lackawanna and Western Railroad, for the extension of the Delaware, Lackawanna and Western from Binghamton to Buffalo. The trustees of the fund are President Sam Sloan, of the Delaware, Lackawanna and Western Railroad Company, and Edwin F. Hatfield, Jr., President of the Lackawanna Iron and Coal Company. The hospital is to be located at Scranton, Pa. Both of the companies, for the benefit of whose employes the hospital will be, have offered sites for the building. The building will cost between $25,000 and $50,000.

A 1,000 Acre Vineyard.

Rene Nadeau (who persistently urges the slicing and drying of beets on the field and milling them, thus reduced 84 per cent., with treble sugar production) is just completing the planting of a 1,000-acre vineyard in Los Angeles County, probably the largest in the world. This French viniculturist pronounces the southern counties of the State the finest climate of the earth for grapes. His selection is mostly the Mission (sherry) and the black Malvoisie. He commands perfect irrigation, Nadeau's large grove of eucalyptus trees is so markedly successful that he is preparing to plant a forest of those semi-barbaric trees. The numerous nurseries of California have sold every variety of plants and cuttings they had, and still orders come for more.

All over California there is a veritable fruit-planting boom. Grape cuttings by millions, notably for raisins; hundreds of thousands of German prunes, apricots, peaches. Read, of Yolo, in the warm belt, is planting 300,000,000 of Eastern peach pits. His experience teaches that peaches thrive best when left to nature, and the run of the fruit suits for canning.

Breakage of Submarine Cables.

Submarine cables are very frequently broken by ships carelessly anchoring on the line of the cable, although this is laid down on the charts. Secondly, by ships carelessly dragging their anchors across the line of the cables. Thirdly, by trawlers, trawling with equal carelessness, and thus severing the cable. Fourthly, by the willful action of the crews of both ships and trawlers, who, when they find their tackle caught by the cable, bring the latter to the surface, and instead of clearing it properly and letting it down undamaged to the bottom again, free themselves by cutting the cable asunder. Fifthly, by ships navigating perilously near the cable ships, both in cable-laying and cable-repairing expeditions. Sixthly, by fishing boats casting their nets so as necessarily to drift across buoys and cable ships employed in repairing operations, thus impeding them or rendering them impracticable; and, seventhly, the destruction carelessly or willfully of buoys attached to cable ends or anchored as "mark" buoys during repairs. All these careless or willful acts might at least be reduced in frequency if made punishable under international law.

Sonnet—Memory.

What we miscall our life is Memory;
We walk upon a narrow path between
Two gulfs—what is to be and what has been,
Led by a guide whose name is Destiny;
Beyond is sightless gloom and mystery,
From whose unfathomable depths we glean
Chaotic hopes and terrors dimly seen
Reflections of a past reality,
Behind, pursuing through the twilight haze,
The phantom people of the past appear;
Hope, happiness and folly, fruitless strife,
And all the loved and lost of other days;
They crowd upon us closer year by year,
Till we as phantoms haunt some other life.

Telegraphic and Telephonic Notes.

Telegraphic Improvement.

TESTING A NEW MAIN LINE SOUNDER—A DELICATE INSTRUMENT OF UNUSUAL SUSCEPTIBILITY COMBINING THREE DIFFERENT POWERS.

A curious little instrument, ticking loudly and fast, was the center of attraction in the Western Union Telegraph office one evening last week. It was a "main line sounder," the first of its kind that does away with the local batteries, and as such a genuine source of wonderment to operators and electricians. All the telegraphic sound instruments of the world are now owned under one patent, and the efforts of the experimenters have not been able to devise anything to save the expense of local batteries without infringing on this patent. It is a somewhat curious fact that the inventor of the "main line sounder" now being tested in the Dey-street office is not connected with any telegraph company, nor is he a professional electrician. Mr. Charles G. Burke, the inventor, is a resident of this city, and has just returned from Washington, where he has applied for a patent.

In the present system the relay and local battery are entirely dispensed with and only the main line battery and sounder employed. The sounder is of a peculiar construction. Two magnets of high resistance are employed. One is placed on one side of the lever and one on the other. The lever being pivoted in the center, both magnets, although attracting in opposite directions, tend to move the lever in one direction only, and the power of both magnets is therefore utilized at the same moment by the employment of the same electric impulse and for the same purpose. The position of the magnets and lever greatly increases the effect of the current on the lever, as the weight of the lever is made auxiliary to the power of the magnets in the down or initial stroke of the lever or hammer. The up stroke of the lever is secured by a retracting spring of great force, much more powerful than is ordinarily used, and the power or tension of this spring is kept fixed. In opposition to this retracting spring is another powerful spring, whose tension is in the line of the attraction of the magnets, and which can be increased or diminished at the pleasure of the operator. By the use of this spring, which is entirely new in its application, a balance of opposing forces is preserved, and the magnetic power is used to destroy this balance and thereby produce the desired movement of the lever, and which vibrates with a force in proportion to the power of the opposing springs and energy of the battery as the key of the operator is made to close or open the circuit at either end of the line.

In the new sounder, then, the initial or down stroke of the lever is effected by the combination of three forces or powers—the magnetic power of electric energy, the mechanical power of the adjustable spring, and the natural power of the gravity of the lever itself; while the secondary movement of up stroke of the lever results from the force of the retracting spring, which manifests its power when the electric energy is interrupted or ceases. As the retracting power is unchanging, a uniform force of retraction is attainable, and as any change in magnetic power can be compensated for by increasing the power of the spring acting with the magnets, a uniform degree of operative opposition of forces can be preserved. The instrument is now being thoroughly tested in the Western Union office here, and in the office of the Baltimore and Ohio Railroad at Washington. An official of the former company says that if Mr. Burke's invention will do thoroughly what is claimed for it it will cause a revolution in sound telegraphy, saving many thousands of dollars to the companies in which the public should share. The Western Union Company has 10,000 offices with an average of five local batteries, making 50,000 batteries. The batteries cost originally about $4 each and $2 a year to keep them up. This expense would be saved, to say nothing of the trouble obviated and the convenience secured.

Telegraph Facilities in Mexico.

CITY OF MEXICO, April 10.—The completion of the telegraph between San Blas and Guadalajara places all the State capitals in telegraphic communication with this city.

Defeat of Jay Gould!!!

It is said that Mr. Pender and those associated with him have been successful in forcing Mr. Jay-Gould to accept 11 per cent. of the Anglo-American traffic for the cable just completed, and another 11 per cent. as soon as the second cable is finished. From American papers we notice that the two Jay-Gould cables cost the American Cable Construction Company about £1,200,000. Estimating the transatlantic traffic with the two shilling rate at £2,600 per day, this will be a remunerative rate to Jay Gould, and in our opinion the forcing has been all the other way. Our heading should therefore be "Defeat of the Cable Ring."—*Electric Review.*

Mutual Union Suits Discontinued.

In the suits of Pliny H. Babbitt against the Mutual Union Telegraph Company, George William Ballou, William H. Bingham, David H. Darling, Allan S. Weeks, John G. Moore, Thomas C. Purdy and Edwin Lord to have the shares of stock of the Mutual Union increased, a stipulation was filed in the clerks office of the United States Circuit Court, by which it was agreed to discontinue the action without costs or allowances to either the plaintiff or defendant, and also agreeing to waive all claims arising out of or based upon this action or any proceeding taken therein whether in the State Superior Court or the United States courts. The stipulation was duly signed by the respective parties in the action.

Proposed Telegraph Stations in the Ocean.

A Frenchman, M. Menuisier, has just proffered a novel and bold plan for enabling vessels crossing the Atlantic to communicate with the mainland. Lay, he says, a telegraph cable between Saint Nazaire, Bordeaux and New York, with branch in mid-ocean to Panama. Every sixty leagues, the average daily distance covered by a ship, connect to the principal cable a vertical cable ending in a buoy at the surface. To the right and left of the principal cable lay two branch cables, ten to twenty leagues each, ending in a vertical cable with buoys. These branches would form two crosses with the main cable. The chances of ships sighting buoys would thus be frequent. Each buoy has a number, and its position in mid-ocean is known from special tables. When a ship passing near a buoy wishes to telegraph, it connects its apparatus wire, one with the wire of the buoy, the other with the buoy itself, which serves as an earth-wire. Thus the ship might communicate with a central post which should be established on an island or rock, or a ship moored according to M. Menuisier's system. A vessel in distress near one buoy might, through the central station, get help from a ship passing near the next buoy. The difficult matter would be the buoy. How would it resist storms that have broken cables? M. Menuisier has not yet described it in detail, but says it is pronounced quite successful by competent navigators. It is luminous by night, sonorous in fog, and easily accessible in any weather.

Mr. Strangways' communication being a two page article was crowded out of this issue. The following may be of interest to some telephone people.

The Action of the Telephone.

To the Editor of The Electrical Review.

SIR: Mr. Strangways's arguments which he brings forward to prove that the articulating telephone can work by a make-and-break action are, in my opinion, entirely false. At the commencement of his letter the writer says: "Now, it is impossible for any one to allege that the secondary current from an induction coil is in any way analogous in its nature to what Bell describes as an undulatory current; and unless all our previous investigators have been altogether in the wrong as to the action of the induction coil, the current generated in the secondary is instantaneous only, whatever may be the direction in which it may flow." Mr. Strangways is entirely in error here; the current generated in the second wire of an induction coil is "instantaneous" only when the make-and-break action takes place in the primary. I use the word "instantaneous" here advisedly, for, strictly speaking, the word "instantaneous" is incorrect, as it means "absence of time," whereas the very fact of a current existing means that it passes for a definite period. If Mr. Strangways will take an induction coil and for a lengthened period (comparatively), say, of five seconds, will send through the primary coil a current whose strength continually and uniformly diminishes or increases, he will find that so far from getting what he calls an instantaneous current in the secondary, he will get for that period of five seconds a *continuous and uniform current*, and, moreover, if the variation in the primary current be irregular instead of uniform, then the current in the secondary will be irregular in sympathy. No instrument illustrates the flow of the current in the secondary wires of an induction coil so instructively as does the Bain chemical recorder. Let Mr. Strangways connect the secondary wires of an induction coil to the metal roller and stylus respectively of a Bain instrument, and then let him send makes and breaks and also *variations* of current through the primary, and I think he will be convinced that he has written rather hastily, and that the secondary current from an induction coil *can* be, and in the case of the telephone apparatus *is*, undulatory.

Mr. Strangways says: "The idea of an undulatory current is that of a current passing continually without ceasing, but varying in quantity or power." This is certainly not correct, for according to Mr Strangways if we have, say, a uniform series of waves whose crests are due to a potential of 8 volts, and whose depressions are due to a potential of 5 volts then, although the forms of the waves would be exactly similar if the crests were due to a potential of 8 — 5, or 3 volts, and their depressions to a potential of 5 — 5, or 0 volts, the waves in the latter case could not be waves, because their depressions are at a point where there is no potential—*i. e.*, where no current flows.

On referring to Mr. Strangways's first letter, I find the following: "I find that the average compass of the human voice is about two (2) octaves, varying from 87 to 775 vibrations per second, so that by make-and-break you can transmit a number of currents of electricity per second, both fewer and greater than the number of vibrations to be found in the full compass of the human voice. This being so, why cannot make-and-break transmit and reproduce the human voice in the telephone?" I must confess that it is hardly credible that Mr. Strangways can really mean this as an argument. It amounts to this, that because a railway train and carriage can both travel at a rate of from one to ten miles an hour that, therefore, if the carriage pursues a sinuous course along the road the railway train can do the same also on its rails. Yours faithfully,

TELEPHONE, London.

The talk about modifying the terms of the American cable lease is probably destitute of foundation. The Western Union Telegraph Company has made in writing the proposition heretofore described, namely, a guarantee of 6 per cent. per annum on $10,500,000 stock, and the proposition has been accepted, likewise in writing, by the principal stockholders of the Cable Construction Company. Under the decisions of the courts in the elevated railroad cases, the minority of the stockholders cannot prevent the consummation of any agreement which the majority may make, and the lease will probably be executed as soon as the papers can be drawn and the stock certificates engraved. Then the Construction Company, we understand, will be dissolved, no further calls being made on the stockholders, and a new company will be formed for the construction of the Brazil cables, if they are to be constructed at all.

The injunctions restraining the Mutual Union Telegraph Company from issuing its stock having been dissolved, the stock was issued to-day simultaneously in this city, Boston, and Philadelphia. The securities of the company will undoubtedly be listed on the Stock Exchange at the next meeting of the Governing Committee, on Wednesday next, April 8th.

A NEW METHOD OF HARDENING STEEL.—According to a "note" presented by M. Dumas at a meeting of the French Academy of Sciences, M. Clemandeau has discovered a new method of hardening steel which M Dumas considers a very important one. He takes a bar of steel, beats it to cherry red, incloses it in a casing which it fills exactly, and submits to sudden great hydraulic pressure. It is allowed to cool under pressure, and is then found to be hardened and strongly magnetic. Magnets thus prepared are now used for telephones.

THE TELEPHONE IN MONTREAL, CANADA.—At the annual meeting of the Bell Telephone Company, held at Montreal, the chairman congratulated the shareholders upon the successful results of their business, which had enabled them not only to write off the whole of the preliminary expenses account, and put aside $5,000 to meet unforeseen contingencies, but also to pay 6 per cent. dividend on the capital of the company, and carry a balance of between $4,000 and $5,000 forward to next year.

EXHIBITION AT BORDEAUX.—*La Lumiere Electrique* says that at the approaching exhibition to be held at Bordeaux a special space will be set apart for electrical apparatus. The Compagnie des Telephones of Paris intend to open an office in the exhibition buildings, where visitors will be able to listen to the performances of the principal theatres of Bordeaux. There will also be an electrical tramway running, similar to that in use at Paris. The car will run on the ordinary tram lines from the Place de la Comédie to the interior of the exhibition.

On Microphonic Contacts in Vacuo.

In a recent number of the *Zeitschrift fur Electricitatslehre*, Herr Berliner writes on the above subject. According to him, the change in the thickness and density of the strata of air between the vibrating portions of a microphonic contact causes great changes in its resistance. As the resistance of a very dense carbon is not increased by pressure, he explains the fact that the resistance of a microphonic contact can reach a megohm by the intermediate air strata. To confirm this view, he placed a Blake transmitter in a wooden box, hermetically closed, and capable of being connected with an air pump. Two metal conductors traversed the sides of the box, and enabled the transmitter to be connected with various instruments. The resistance of the contact was weakened by $\frac{1}{8}$ when a vacuum was created. When the microphone with one cell of the battery was placed in the primary circuit of an induction coil, and a telephone in the secondary circuit, the intensity of the sound transmitted was the same when the transmitter was in contact with the air, as when it was in a vacuum. An editorial note by our contemporary remarks that the way in which the two carbons are fixed, one on the other, has also an influence on the contact resistance. The resistance of the air by itself should vary, as in the electric arc, inversely to the intensity of the current

Telegraphers' Mutual Benefit Association.

P. O. Box 3,175, New York.

ASSESSMENT, No. 150.—March 20, 1882.

JOSEPH E. RANNEY. HUBERT L. GRAMZOW.

JOSEPH E. RANNEY died at Peoria, Illinois, Feb. 17, 1882, of consumption. His certificate, No. 1,953, was issued April 2, 1873.

The above claim will be paid from surplus.

HUBERT L. GRAMZOW died at Ogden, Utah Territory, Feb. 21, 1882, of dropsy. His certificate, No. 3,189, was issued Nov. 15, 1877.

One dollar is due to meet this assessment from members holding certificates up to and including No. 4,070.

Insurance expires April 19, 1882; membership, May 19, 1882.

The number of members of the association in good standing is: First division, 2,183; second division, 130.

Remittances will be acknowledged by agents of the association when postage or postal card is enclosed; and an agent's receipt is a sufficient voucher for all dues by members. Remit by draft, express, P. O. order, or registered letter. Money forwarded by mail or messenger will be at the risk of sender. A number of assessments may be paid in advance, to avoid small remittances.

BY-LAWS.—SECTION VIII. "Upon the death of a member of the association, the Secretary shall levy an assessment of one dollar upon each surviving member, when directed so to do by the Executive Committee; and, in case payment shall not be made within thirty days thereafter, the delinquent shall forfeit all claim to the benefits of the association; and, should payment not be made within sixty days, shall forfeit membership, to which said delinquent can only be restored as provided in Section VII. of these by-laws.

P. O. Box 3,177. A. R. BREWER, Secretary, New York.

New Jersey Becoming Smaller.

Owners of real estate along the New Jersey coast may perhaps be led to reflect, by the annual report of Prof. Cook, the State Geologist, on the vanity of laying up to themselves riches where the surf and tide encroach, and where the sea breaks through and steals. From Sandy Hook all the way to Cape May, he says, the shore has been steadily worn away for a century. At Shrewsbury inlet the water line has moved inland from 165 to 330 feet since 1853; at one part of Long Branch, 375 feet, and opposite Whale Pond, 525 feet. It is known that about the year 1700 the line near a part of Cape May extended more than a thousand feet further out than now, while at Cape Island the shore has been worn off fully a mile during much less than a century. There is evidence not only of the attrition of the waves but of the general rise in the high-water level. Dead trees in great numbers are found standing in the tide marshes all along the coast; it is obvious that the great salt meadows between Newark and Jersey City were once arable uplands; islands have disappeared under the water—one, in Elsenborough, which contained ten acres of good farm land as late as 1865, being now utterly submerged; Money Island has also gone, and so has Round Island, which had forty acres of upland in 1803. New Jersey never was among the larger States, but it is evidently destined to become smaller, as well as to illustrate, by its fate, how the contours of continents change in the ages.

England's Tunnel Panic.

The fear of invasion which seized the British public ten years ago, after the capture of Paris by the Germans, has been repeated and surpassed by the alarm about the Dover tunnel. Field Marshal Moltke's recent declaration that no good general would ever risk such a route of invasion, when, by electric or other appliances, his army could be drowned or suffocated, may have given a momentary gleam of comfort, but the dread and the foreboding are now as dense as ever. Ardent patriots suspect the German strategist of trying to lull the British lion with a false sense of security; timid capitalists ask why life should be made a burden through apprehension, for the sake of travelers who have a tendency to seasickness; while even eminent military authorities, like the Duke of Cambridge and Sir Garnet Wolseley, warn their country against the perils of the tunnel, and Gen. John Douglas publishes this appeal in a London newspaper.

"If once the tunnel is made, this country will live in a perpetual state of scare, as bad as if we were actually at war. If forts are to be built, they will require arming and manning and keeping up, and where are the troops to come from, and who is to pay the expense? If the railways are to pay the expense of all this, where are the dividends to come from? * * * Providence has given us the sea as our safeguard. Why should we fly in the face of Providence, and throw our safety away for what, after all, is a mercantile speculation, and certainly cannot be called a necessity?"

It may be imagined, when bold soldiers are in this state of mind about the possibilities of the tunnel, with what terror it strikes the average British householder and civilian. To distant observers this degree of apprehension over a single impracticable line of military approach seems absurd. That Russia or Germany should be able, unperceived, to surprise and hold the tunnel and its Dover head, is little less than preposterous; it is hardly conceivable that even a French army could approach within ten miles of the Continental end without discovery and telegraphic or other seasonable warning from the tunnel authorities there. But, were this approach possible, the tunnel could quickly be made not only impassable to an army, but the grave of any force already in it. The author of the pamphlet which, imitating "The Battle of Dorking," invents a tunnel invasion of England, introduces soldiers disguised as tourists to seize the works at the Dover end, and then supposes that by accident all the appliances for preventing access through the tunnel failed to work. With so liberal allowances to favor invasion, there is no need of presupposing any tunnel at all.

The real danger is evidently not in any one tunnel, but in the future multiplication of such connections between the Island and the Continent. It is conceivable that with a great many lines there might be negligence or treachery that would be advantageous to an invading force. This notion was in the mind of Napoleon III. twelve years ago, when he used this language.

"The English will hesitate long about allowing a tunnel to be built, for fear lest we should invade them; but if a first tunnel be made and succeeds, a second and a third will quickly be constructed, and then the English alliance would bring us at once new possibilities and some new dangers. If we went to war having the English for our allies, they would send their troops over through the tunnels, and we might have a large army on our shores in a few hours; but if the British Government subsequently disagreed with us as to the conduct of the war or the time for concluding peace, what would our position be then?"

Miscellaneous Notes and Facts.

Every-day Heroes.

Oh, yes; they are all around us,
And in every walk of life:
Heroes the best, that stand the test
In many an unmarked strife:
Heroes of home, of shop, of farm,
And at duty's call alone,
Though unaware of honor's share,
And by noisy fame unblown.

From a flame-girt lofty window
Wild faces and hands entreat
Vast crowds, agape, that no means can shape,
For aid from the icy street:
When a bootblack climbs an adjacent pole,
And swift from its peak impels
A rope of wire down the wall of fire,
And the cry, They are saved! upswells.

High waving his danger signal,
The under-paid switchman speeds
O'er the quivering ridge of a broken bridge,
That to death and destruction leads,
To sink, as the thundering train slows up,
O'ertaxed in the headlights glare,
While but few can know what to him they owe,
Though he should be dying there.

Oh, yes; they are all around us,
And to instance their deeds were vain,
So hidden away in the crowds are they,
In the paths obscure and plain;
From those whose chivalry, unesteemed,
Through a lowly lifetime shines.
To such in the rout whose acts stand out
For the rest like starry signs.

And nothing is lost, though hidden,
That springs from heroic seed;
In the larger force, and the higher course
That are shaped from a single deed.
The environment of a mass of men
May brighten and spread apace,
Till the deeds shall throng all parts along
To the glory of all the race.

A New York-Boston fast train is to be put on by the Boston & Albany and the New York, New Haven & Hartford companies about June 1. The present intention is to limit the train to one baggage car and four drawing-room cars, and to start it from each end of the line about 5 P. M. The train is to make the run of 234 miles in five hours, or at an average speed of 46.8 miles an hour, making regular stops only at New Haven, Hartford and Springfield. The fastest time will be made on the 74 miles between New York and New Haven, which the train is expected to cover in 90 minutes, or at the rate of 49.3 miles an hour. Now, while no stops will be made at stations, it will be necessary for the train to stop at least four times on this division at drawbridges, where a full stop is required by law, so that a speed of 60 miles an hour, over part of the road at least, will be necessary to make time. The New Haven company is building two engines in its shops for this train especially. They have 18 by 24-in. cylinders and driving wheels 7 ft. in diameter.

Statistician Worthington, of the United States Bureau, has recently furnished estimates of the value of crops of Indian corn, wheat, rye, oats, barley, buckwheat, hay, cotton and tobacco as being $2,131,051,859, with agricultural exports amounting to $737,862,617.

There are no Gainsborough hats big enough to prevent an old man from seeing the ballet at the theatre.—*New Orleans Picayune.*

The New Orleans *Picayune* says; "It is hard to catch a man's meaning when he carries on a running conversation." Best to bring him to a fool's stop, or put a period to his remarks.

A Model College.—Girard College is so well conducted, says the Philadelphia *News*, that it is almost worth while for a child to be born without parents for the sake of getting into it.

General Hazen is one of the hardest working men in Washington. He puts in about eight hours a day. We are glad there is a public man who tries to earn his pay.—*Rochester Express.*

The Chinaman who thought he was Americanized enough to squeeze a Texas girl's hand on the sly, has departed for some quiet place in the hills where he can pick sixty bird-shot out of his legs.—*Detroit Free Press.*

Æsthetic wife (sobbing): "Dearest, I'll see that your grave is kept green—but not one of those horrid bright greens. A nice olive-gray green, with an old bronze tombstone, will look too awfully lovely for anything."—*Ex.*

An editor living in Florida: "It is years since we have experienced such a thing as winter." After the paper went to press he committed suicide, and simply because the compositor had set up the last word "water" instead of "winter."—*Ex.*

A statistical fiend estimates that it takes 100,000 elephants yearly to supply the ivory of the world. If the game of billiards were to be abolished about 25,000 elephants would supply the demand, and about 500,000 married men would be home earlier in the evening.—*Norristown Herald.*

It is well enough to say "paddle your own canoe," but to keep away from the dangerous places in the stream of life, a paddle is not alone sufficient. A man must have a good pole also.—*Boston Transcript.*

It isn't the stream of life that is dangerous: it's the whiskey.

The duties collected at the Custom House during March amounted to $13,999,148.75; during March, 1881, to $13,122,863.93—an increase of $876,284.83. Since January 1 the total number of invoices received has been 55,393 against 45,720 during the first three months of 1881—an increase of 9,673.

Moses Taylor has a kind heart for the employes of the great road which owes so much to his creative energy, the Delaware and Lackawanna. He gives $250,000 of bonds worth $270,000, for the foundation and support of a hospitable for the employes of that road. It is a wise, thoughtful and generous gift and worthy of the man.

Domestic bliss: "I never tire of reading Paradise Lost," said Miss Posigush, her eyes beaming with a dreary languor. "Don't you admire it, Mr. Crab?" "No, I don't," replied Crab, crisply, "I used to read it before I was married, but now"—casting a look toward Mrs. C.—"I know what Paradise Lost is without reading it." No wonder Mrs. Crab says Crab is a brute.—*Boston Transcript.*

The San Francisco *Bulletin* says: "A great many people in the east do not understand the Chinese question." Well, no, nor in the west neither. We dislike to display ignorance as much as any living man, but we will frankly confess that the Chinese question, any Chinese question, in fact, if put in the genuine tea-chest language, freezes us clean out of the deal. If you want your questions answered at this office, ask them in plain United States.—*Burlington Hawkeye.*

Taking Time by the Forelock.

At the battle of Groveton Stonewall Jackson tried an experiment which nearly frightened a Federal division out of their boots. Bars of railroad iron were cut up into foot lengths and fired from some of his heaviest guns, and the noise these missiles made as they went sailing through the air was a sort of cross between the shriek of a woman and the bray of a mule. The Federals listened in wonder at the first few which banged through the tree tops, and presently one of the pieces fell just in front of a Pennsylvania regiment. A captain stepped forward to inspect it, and after turning it over, he rushed to his Colonel with the news:

"Colonel, them infernal rebs are firing railroad iron at us!"

"No!"

"They are, for a fact!"

"Captain, advance your company to that ridge and deploy, and the minute you find Jackson is getting ready to fire freight cars at us send me word. I don't propose to have my regiment mashed into the ground when it can just as well be decently exterminated in the regular way!"—*Detroit Free Press.*

Sam Ward's Recollections.

The genial Sam Ward sold Longfellow's "Skeleton in Armor" to Lewis Gaylord Clarke, editor of the old *Knickerbocker Magazine*, for $50. We presume a very ordinary production would bring that price in one of our popular periodicals nowadays. Curiously enough, Uncle Sam also undertook to dispose of the "Hanging of the Crane" for the poet, and got $4,000 for it from Robert Bonner, of the *Ledger*. This was at the rate of $20 a line. Sam Ward pays this tribute to his friend's memory: "Nothing human that I ever knew exceeded the tenacity of his friendship. His heart might be likened to a precious library, in which the recollections of his friends were enshrined like rare volumes, to be taken down and cherished when the corresponding friend appeared before him or awoke his attention by a letter. There was no jealousy in his composition, and no poet was ever a more sincere admirer of the productions of genuine aspirants to the guild. His charities were many and constant, and I know of an instance in which his purse for years provided support for the family of an old schoolfellow."

Keely Ordered to Talk.

Philadelphia stockholders in the Keely Motor Company have been suspicious for a long time. Keely has now and then given exhibitions of the power of his machine, but, as he has given no opportunity for investigation, his exhibitions have not been satisfactory. At a recent meeting of the stockholders, Keely was asked to divulge the secret to two stockholders. They argued that, if Keely should die and the secret remain locked up in his breast, the stockholders would lose everything, for the intricate machinery, carefully guarded from all intruders, would be of no value without a knowledge of its parts and principles. But Keely was inflexible. He refused to tell anything, and the company filed a bill making it mandatory upon him to make the process of securing tremendous results from a little water known to two responsible men. Keely at once entered a demurrer. It has been argued during the past two days, and to-day Judge Peirce decided in favor of the company. The Court held that it was no answer for the defendant to say that the Court could not enforce a decree even if it were made, and that, therefore, the Court ought not to make it. The Court could at least try.

Marriage is the one thing in which a mistake is fatal. In other affairs experience may profit one, but in marriage wisdom lies in forethought.

Berly's Electrical Directory and Advertiser, 16 New Bridge Street, Blackfriars, London.

In our issue of December 1st, 1881, we took notice of a specimen page of "Berly's Electrical Directory," and expressed an opinion then that, as far as we could judge, the arrangement was all that could be desired. Now that the book is completed we have great pleasure in endorsing our former judgment, and the highest praise we can bestow is that it ought to find a place in the libraries of all those either directly or indirectly connected with electric science. Although not so complete as the next issue will be (a "Continental Directory" being in preparation for this), it will be found most interesting and highly useful now. Amongst its contents the "remarks on the past years" will be found to contain much information in a concise form. The "tables and formulæ" will be of use to practical engineers. Now that so much progress is developing in electrical science amongst all classes of manufacturers and engineers, the various "trades" and "professional" lists will be found very advantageous to those desiring to know to whom to apply for apparatus or information on any particular subject. A list of electrical publications, with publishers' names and prices will materially assist those studying electrical matters. The idea of such a manual is original, and its success is certain, for it is the only thing of the kind published, and it well supplies a long-felt want.—*Electrical Review.*

To the Editor of the Telephone and Telegraph Review:

SIR.—In a recent trip in Europe I was delighted to find that many young men were studying electrical engineering. This being the latest profession, it has not yet become overcrowded. Great fortunes have been made in this country and Europe in this new profession.

If any of the readers of your admirable journal are interested in this matter I should be pleased to give them any information in my power. There is one place in the United States, one place in France and two places in England where it is taught, I believe.

Yours very respectfully,

Editor *Homes of America.*

We desire to call attention in another column to the advertisement of E. W. Wagner, manufacturer of electro-medical apparatus. Mr. Wagner makes a specialty of Gaiffe's system pocket batteries, which are so favorably known throughout the country. Mr. Wagner also makes various styles of batteries and enjoys the reputation of placing none but the best goods to be found of the kind upon the market, and those who may deal with him may be sure of getting nothing but first-class instruments at as reasonable prices as can be purchased anywhere.

THE WATERBURY WATCH is a substantial and accurate time piece, of a newly improved design, stem winder, open face, in silverloid cases, and sell for about three dollars and a half.

It is a good time keeper, varying not more than a minute or two in a week, and will last for several years. Each watch is thoroughly tested and regulated before leaving the factory, and is all ready for use when sold by the retailer. So well known have they become as reliable time keepers, thousands try them in preference to higher priced watches.

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The bill further provides that in all cases where letters patent shall be extended under the provisions of the act, the Commissioner of Patents shall advertise the application for the space of three months in some newspaper of general circulation, and a hearing be given to all persons objecting to the extension; the applicant is allowed the right of appeal to the District Court of the United States for the District of Columbia, on giving bond for cost. The cost of the advertisement is to be paid by the inventor, if he is able; if not, it is to be paid out of the fund subject to the control of the Commissioner of Patents, and remain a lien in favor of the government on the patent until the same is paid.

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Number of applications for patents for inventions	24,878
Number of applications for patents for designs	678
Number of applications for reissues of patents	503
Total of applications relating to patents	26,059
Number of caveats filed	2,406
Number of applications for registration of trade marks	611
Number of applications for registration of labels	383
Number of disclaimers filed	14
Number of appeals on the merits	784
Total	4,188
Total number of applications requiring investigation and action	30,242
Number of Patents issued, including design	16,113
Number of patents reissued	471
Number of trade marks registered	834
Number of labels registered	202
Total number of patents granted and certificates issued	17,620

Of the total number of patents granted, 995 were to citizens of foreign countries, of which England took 343, Canada 215, Germany 213, France 116, Austria 29, and Switzerland 16, no other country reaching 10 in number. The number of patents granted exceeded that of 1880 by 2,637.

Last Year's Electrical Patents.—Great Britain.

Some idea of the extraordinary activity at present existing in the development of electrical science, and the practical application of electricity to various useful and industrial purposes may be gathered from the following statistics compiled by Messrs. J. K. Fahie & Son, of the patent offices, High Holborn, London, and Nassau street, Dublin: During the year 1881 it appears that no less than 237 applications for British patents have been recorded in Her Majesty's Patent Office for inventions which may be classed under the heading of electricity. Of this grand total 135 emanate from British applicants, 52 from American citizens, and 50 from residents on the Continent (France, Germany, Belgium, etc.). Classifying the whole number of 237 applications under special heads, it appears that 93 specifications have been lodged for improvements in electric arc lamps, 20 for improvements in incandescent electric lamps, 38 for magneto and dynamo machines, 32 for secondary batteries or electric accumulators, 26 for regulating, controlling and measuring the electric current, 24 for miscellaneous appliances connected with electric lighting, and 4 for producing power and transmitting motion. Reviewing the names of the applicants for the above patents it appears that the celebrated American inventor, Edison, stands highest on the list, having applied for no less less than 24 patents for various electrical improvements. Messrs. Swan and Lane Fox each filed seven applications, mostly in connection with incandescent lighting, and M. Faure, of Paris, three for secondary batteries, while Mr. Maxim filed two, and Mr. Brush one for arc lighting apparatus.

It is estimated that since the discovery of gold in California in 1848, followed by the opening of rich mines in Australia in 1851, those two countries have furnished gold to the amount of $4,355,000,000.

NEW PATENTS—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 21ST, 1882.

255,137. Armature for Dynamo-Electric Machines. George H. Brown, New York, N. Y., assignor to Charles A. Cheever, same place. Filled Nov. 14, 1881. (No model.)

255,124. Apparatus for Signalling by Electricity. Joseph W. Stover, Newton, Mass. Filed Nov. 18, 1881. (No model.)

255,362. Absorbent for Electric Lamps. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Oct. 17, 1881. (Model.)

255,252. Apparatus for Removing Tin and Galvanized Coating. Thomas H. Campbell, Allegheny, Pa Filed Dec. 2, 1881. (No model.)

255,332. Automatic Telegraph. Charles A. Randall, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,364. Dynamo-Electric Machine. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Oct. 17, 1881. (No model.)

255,366. Dynamo-Electric Machine. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 12, 1881, (No model.)

255,170. Electric Lamp. Alfred G. Holcombe, New York, N.Y., assignor to the Standard Electric Light Company, same place. Filed Dec. 1, 1881. (No model.)

255,277. Electric Lamp. Charles H. Gimingham, Newcastle-upon-Tyne, County of Northumberland, England. Filed Dec. 23, 1881. (No model.)

255,148. Electric Lamp. Leonard E. Curtis, New York, N. Y., and Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y. Filed Nov. 11, 1881. (No model.)

255,186. Electric Lamp. Joseph Olmstead, New York, N. Y., assignor to the United States Electric Lighting Company, same place. Filed June 23, 1881. (No model.)

255,171. Electric Lamp. Alfred G. Holcombe and Levi H. Colborne, New York, N.Y., assignors to the Standard Electric Light Company, same place. Filed Dec. 1, 1881. (No model.)

255,223. Electric Lamp. Addison G. Waterhouse, New York, N. Y., assignor to the United States Electric Lighting Company, same place. Filed Dec. 3, 1881. (No model.)

255,225. Electric Lamp. Edward Weston, Newark, N. J., and Leonard E. Curtis, New York, N. Y., assignors to the United States Electric Lighting Company, New York, N. Y. Filed Nov. 11, 1881. (No model.)

255,363. Electric Lamp Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 18, 1881. (No model.)

255,304. Electric Lamp. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,305. Electric Lamp. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 4, 1881. (No model.)

255,307. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 20, 1881. (No model.)

255,306. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 20, 1881. (No model.)

255,308. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,312, Electrical Engineering. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,236. Electric Drill. Charles E. Ball, Philadelphia, Pa., assignor to Charles A. Cheever, Trustee, New York, N. Y. Filed Dec. 31, 1881. (No model.)

255,365. Electro-Magnet. Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,212. Globe-Supporter for Electric Lamps. John Tregoning, Philadelphia, Pa., and Lewis H. Latimer, New York, N. Y. assignors to the United States Electric Lighting Company, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,219. Electric Incandescent Lamp. William L. Voelker, Pa., assignor to John H. Irwin, Trustee, same place. Filed Dec. 13, 1881. (No model.)

255,309. Manufacture of Carbon Conductors. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 10, 1881. (No model.)

255,249. Means for Charging and Discharging Secondary Batteries. Charles E. Buell, New Haven, Conn. Filed Dec. 28, 1881. (No model.)

255,248. Means for Charging Secondary Batteries. Charles E. Buell, New Haven, Conn. Filed Jan. 13, 1882. (No model.)

255,377. Means for Utilizing Secondary Batteries on Telephone Circuits. Charles E. Buell, New Haven, Conn , assignor of two-thirds to James G. Smith, Hackensack, N. J , and George W. Coy, Milford, Conn. Filed Dec. 3, 1881. (No model.)

255,378. Protector for Telegraphic Instruments. M. Daniel Connolly, Philadelphia, assignor to Chas. S. Bradford, Jr., West Chester, Pa. Filed Jan. 21, 1882. (No model.)

255,311. Regulator for Dynamo-Electric Machines. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 5, 1881. (No model.)

255,310. Speed-Regulator for Dynamo-Electric Machines. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed July 20, 1881. (No model.)

255,373. Telegraph Relay and Repeating Instrument. Jared R. Woodfill, Aurora, assignor to John I. Woodfill, Nichols, Mo. Filed Oct. 27, 1881. (No model.)

255,333. Telephone Relay. Charles A. Randall, New York, N.Y. Filed Sept. 19, 1881. (No model.)

255,354. Telephone. Harry S. Thornberry, Winona, Minn. Filed Nov. 4, 1881. (No model.)

255,239. Telephone System. Emile Berliner, Boston, Mass. Filed Dec. 15, 1881. (No model.)

255,295. Quadruplex Telegraph. Francis W. Jones, New York, N. Y. Filed Jan. 16, 1882. (No model.)

TOTAL ISSUE OF MARCH 21, 1882.

Patents	308—No.	255,095 to No.	255,402, inclusive.
Designs	17—No.	12,817 to No.	12,833, inclusive.
Trade-Marks	30—No.	9,204 to No.	9,233, inclusive.
Labels	9—No.	2,644 to No.	2,652, inclusive.
Reissue of patents	2—No.	10,064 to No.	10,065, inclusive.

Total issue.....366

FOR WEEK ENDING MARCH 28TH, 1882.

255,749. Armature for Electro-Magnets. Orosco C. Woolson, Newark, N. J., assignor to Chas. A. Cheever, Trustee, New York, N. Y. Filed April 13, 1881. (Model.)

255,514. Adjustable Reflector for Electric Lamps. James R. F. Kelly, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Mar. 5, 1881. (No model.)

255,661. Device for Connecting Wires in Electrical Apparatus. William Paul, Ansonia, Conn , assignor to Wallace & Sons, same place. Filed Jan. 25, 1882. (No model.)

255,524. Electric Gas-Lighter. Alexander Mahon and William J. Green, Washington, D.C. Filed Feb. 20, 1882. (No model.)

255,453. Electric Annunciator. Henry B. Porter, Chicago, Ill Filed Oct. 6, 1881. (Model.)

255,466. Electric Lamp. Charles W. Siemens, Queen Anne's Gate, Westminster, England. Filed Sept. 16, 1879. Patented in England May 27, 1879.

255,521. Electric Lamp. Charles Lever, Bowdon, County of Chester, England. Filed Aug. 18, 1881. (No model.) Patented in England Aug. 18, 1881.

255,597. Galvanic Battery. William A. Childs, Englewood, N J., and Frank Shaw, New York, N.Y. Filed May 10, 1881. (No model.)

255,497. Incandescent Electric Lamp. Philip Diehl, Elizabeth, N. J. Filed Jan. 10, 1882. (No model.)

255,698. Multiple Telegraph. Benjamin Thompson and Charles Selden, Toledo, Ohio. Filed Mar. 10, 1879.

TOTAL ISSUE OF MARCH 28TH, 1882.

Patents	349—No.	255,403 to No.	255,751, inclusive.
Designs	8—No.	12,834 to No.	12,841, inclusive.
Trade-Marks	19—No.	9,234 to No.	9,252, inclusive.
Labels	4—No.	2,653 to No.	2,656, inclusive.
Reissue of patents	2—No.	10,066 to No.	10,067, inclusive.

Total issue.....382

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisement appears on the next page. In ordering please state the number and date of the patent desired.

New Patents—Great Britain—February and March, 1882.

1132. Improved method or means of applying earthenware tubes and pipes for the conveyance of gas, water, telegraph wires, &c. G. Smith. Dated March 8.

1136. Electric Telegraphs. S. Pitt. (Communicated by H. C Mance.) Dated March 8.

1137. Telegraphic apparatus, especially for street fire-alarms. W. H. Davies and F. H. W. Higgins. Dated March 8.

1139. Dynamo or magneto-electric machines or electric engines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 9.

1142. Means for regulating the generative capacity of dynamo or magneto-electric machines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 9.

1153. Improved substitute for gutta-percha for insulating waterproofing, and other purposes M Zingler. Dated March 9.

1162. Apparatus for the distribution and regulation of electric currents. W. R. Lake. (Communicated by H. S. Maxim.) Dated March 10.

1163. Electric lighting apparatus. W. R. Lake. (Communicated by E. Weston.) Dated March 10.

1171. Mechanism for regulating the burning of carbon or other electrodes in electric lighting apparatus. A. Graham. Dated March 10.

1172. Improvements in incandescence electric lamps and in apparatus employed in the manufacture of the carbon filaments. J. Wanthier. Dated March 10.

1173. Secondary batteries or electric accumulators. J. H. Johnson. (Communicated by A. de Méritens.) Dated March 10.

1174. Generating, distribution, storing, utilization, measuring, and regulation of electricity, and apparatus or means therefor. J. S. Williams. Dated March 10.

1177. Telephones. J. D. Husbands. Dated March 10.

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Total of applications relating to patents	26,059
Number of caveats filed	2,406
Number of applications for registration of trade marks	611
Number of applications for registration of labels	383
Number of disclaimers filed	14
Number of appeals on the merits	784
Total	4,188
Total number of applications requiring investigation and action	30,242
Number of Patents issued, including design	16,113
Number of patents reissued	471
Number of trade marks registered	834
Number of labels registered	202
Total number of patents granted and certificates issued	17,620

Of the total number of patents granted, 995 were to citizens of foreign countries, of which England took 343, Canada 215, Germany 213, France 116, Austria 29, and Switzerland 16, no other country reaching 10 in number. The number of patents granted exceeded that of 1880 by 2,637.

Last Year's Electrical Patents.—Great Britain.

Some idea of the extraordinary activity at present existing in the development of electrical science, and the practical application of electricity to various useful and industrial purposes may be gathered from the following statistics compiled by Messrs. J. K. Fahie & Son, of the patent offices, High Holborn, London, and Nassau street, Dublin: During the year 1881 it appears that no less than 237 applications for British patents have been recorded in Her Majesty's Patent Office for inventions which may be classed under the heading of electricity. Of this grand total 135 emanate from British applicants, 52 from American citizens, and 50 from residents on the Continent (France, Germany, Belgium, etc.). Classifying the whole number of 237 applications under special heads, it appears that 93 specifications have been lodged for improvements in electric arc lamps, 20 for improvements in incandescent electric lamps, 38 for magneto and dynamo machines, 32 for secondary batteries or electric accumulators, 26 for regulating, controlling and measuring the electric current, 24 for miscellaneous appliances connected with electric lighting, and 4 for producing power and transmitting motion. Reviewing the names of the applicants for the above patents it appears that the celebrated American inventor, Edison, stands highest on the list, having applied for no less less than 24 patents for various electrical improvements. Messrs. Swan and Lane Fox each filed seven applications, mostly in connection with incandescent lighting, and M. Faure, of Paris, three for secondary batteries, while Mr. Maxim filed two, and Mr. Brush one for arc lighting apparatus.

It is estimated that since the discovery of gold in California in 1848, followed by the opening of rich mines in Australia in 1851, those two countries have furnished gold to the amount of $4,355,000,000.

NEW PATENTS—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 21ST, 1882.

255,137. Armature for Dynamo-Electric Machines. George H. Brown, New York, N. Y., assignor to Charles A. Cheever, same place. Filled Nov. 14, 1881. (No model.)

255,124. Apparatus for Signalling by Electricity. Joseph W. Stover, Newton, Mass. Filed Nov. 18, 1881. (No model.)

255,362. Absorbent for Electric Lamps. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Oct. 17, 1881. (Model.)

255,252. Apparatus for Removing Tin and Galvanized Coating. Thomas H. Campbell, Allegheny, Pa Filed Dec. 2, 1881. (No model.)

255,332. Automatic Telegraph. Charles A. Randall, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,364. Dynamo-Electric Machine. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Oct. 17, 1881. (No model.)

255,366. Dynamo-Electric Machine. Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 12, 1881, (No model.)

255,170. Electric Lamp. Alfred G. Holcombe, New York, N.Y., assignor to the Standard Electric Light Company, same place. Filed Dec. 1, 1881. (No model.)

255,277. Electric Lamp. Charles H. Gimingham, Newcastle-upon-Tyne, County of Northumberland, England. Filed Dec. 23, 1881. (No model.)

255,148. Electric Lamp. Leonard E. Curtis, New York, N. Y., and Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y. Filed Nov. 11, 1881. (No model.)

255,186. Electric Lamp. Joseph Olmstead, New York, N. Y., assignor to the United States Electric Lighting Company, same place. Filed June 23, 1881. (No model.)

255,171. Electric Lamp. Alfred G. Holcombe and Levi H. Colborne, New York, N.Y., assignors to the Standard Electric Light Company, same place. Filed Dec. 1, 1881. (No model.)

255,223. Electric Lamp. Addison G. Waterhouse, New York, N. Y., assignor to the United States Electric Lighting Company, same place. Filed Dec. 3, 1881. (No model.)

255,225. Electric Lamp. Edward Weston, Newark, N. J., and Leonard E. Curtis, New York, N. Y., assignors to the United States Electric Lighting Company, New York, N. Y. Filed Nov. 11, 1881. (No model.)

255,363. Electric Lamp Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 18, 1881. (No model.)

255,304. Electric Lamp. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,305. Electric Lamp. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 4, 1881. (No model.)

255,307. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 20, 1881. (No model.)

255,306. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed July 20, 1881. (No model.)

255,308. Electrical Meter. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,312, Electrical Engineering. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,236. Electric Drill. Charles E. Ball, Philadelphia, Pa., assignor to Charles A. Cheever, Trustee, New York, N. Y. Filed Dec. 31, 1881. (No model.)

255,365. Electro-Magnet. Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y. Filed Aug. 10, 1881. (No model.)

255,212. Globe-Supporter for Electric Lamps. John Tregoning, Philadelphia, Pa., and Lewis H. Latimer, New York, N. Y. assignors to the United States Electric Lighting Company, New York, N. Y. Filed Sept. 7, 1881. (No model.)

255,219. Electric Incandescent Lamp. William L. Voelker, Pa., assignor to John H. Irwin, Trustee, same place. Filed Dec. 13, 1881. (No model.)

255,309. Manufacture of Carbon Conductors. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 10, 1881. (No model.)

255,249. Means for Charging and Discharging Secondary Batteries. Charles E. Buell, New Haven, Conn. Filed Dec. 28, 1881. (No model.)

255,248. Means for Charging Secondary Batteries. Charles E. Buell, New Haven, Conn. Filed Jan. 13, 1882. (No model.)

255,377. Means for Utilizing Secondary Batteries on Telephone Circuits. Charles E. Buell, New Haven, Conn , assignor of two-thirds to James G. Smith, Hackensack, N. J , and George W. Coy, Milford, Conn. Filed Dec. 3, 1881. (No model.)

255,378. Protector for Telegraphic Instruments. M. Daniel Connolly, Philadelphia, assignor to Chas. S. Bradford, Jr., West Chester, Pa. Filed Jan. 21, 1882. (No model.)

255,311. Regulator for Dynamo-Electric Machines. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Aug. 5, 1881. (No model.)

255,310. Speed-Regulator for Dynamo-Electric Machines. Hiram S. Maxim, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed July 20, 1881. (No model.)

255,373. Telegraph Relay and Repeating Instrument. Jared R. Woodfill, Aurora, assignor to John I. Woodfill, Nichols, Mo. Filed Oct. 27, 1881. (No model.)

255,333. Telephone Relay. Charles A. Randall, New York, N.Y. Filed Sept. 19, 1881. (No model.)

255,354. Telephone. Harry S. Thornberry, Winona, Minn. Filed Nov. 4, 1881. (No model.)

255,239. Telephone System. Emile Berliner, Boston, Mass. Filed Dec. 15, 1881. (No model.)

255,295. Quadruplex Telegraph. Francis W. Jones, New York, N. Y. Filed Jan. 16, 1882. (No model.)

TOTAL ISSUE OF MARCH 21, 1882.

Patents	308—No.	255,095 to No.	255,402, inclusive.
Designs	17—No.	12,817 to No.	12,833, inclusive.
Trade-Marks	30—No.	9,204 to No.	9,233, inclusive.
Labels	9—No.	2,644 to No.	2,652, inclusive.
Reissue of patents	2—No.	10,064 to No.	10,065, inclusive.

Total issue.....366

FOR WEEK ENDING MARCH 28TH, 1882.

255,749. Armature for Electro-Magnets. Orosco C. Woolson, Newark, N. J., assignor to Chas. A. Cheever, Trustee, New York, N. Y. Filed April 13, 1881. (Model.)

255,514. Adjustable Reflector for Electric Lamps. James R. F. Kelly, Brooklyn, assignor to the United States Electric Lighting Company, New York, N. Y. Filed Mar. 5, 1881. (No model.)

255,661. Device for Connecting Wires in Electrical Apparatus. William Paul, Ansonia, Conn , assignor to Wallace & Sons, same place. Filed Jan. 25, 1882. (No model.)

255,524. Electric Gas-Lighter. Alexander Mahon and William J. Green, Washington, D.C. Filed Feb. 20, 1882. (No model.)

255,453. Electric Annunciator. Henry B. Porter, Chicago, Ill Filed Oct. 6, 1881. (Model.)

255,466. Electric Lamp. Charles W. Siemens, Queen Anne's Gate, Westminster, England. Filed Sept. 16, 1879. Patented in England May 27, 1879.

255,521. Electric Lamp. Charles Lever, Bowdon, County of Chester, England. Filed Aug. 18, 1881. (No model.) Patented in England Aug. 18, 1881.

255,597. Galvanic Battery. William A. Childs, Englewood, N J., and Frank Shaw, New York, N.Y. Filed May 10, 1881. (No model.)

255,497. Incandescent Electric Lamp. Philip Diehl, Elizabeth, N. J. Filed Jan. 10, 1882. (No model.)

255,698. Multiple Telegraph. Benjamin Thompson and Charles Selden, Toledo, Ohio. Filed Mar. 10, 1879.

TOTAL ISSUE OF MARCH 28TH, 1882.

Patents	349—No.	255,403 to No.	255,751, inclusive.
Designs	8—No.	12,834 to No.	12,841, inclusive.
Trade-Marks	19—No.	9,234 to No.	9,252, inclusive.
Labels	4—No.	2,653 to No.	2,656, inclusive.
Reissue of patents	2—No.	10,066 to No.	10,067, inclusive.

Total issue.....382

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisement appears on the next page. In ordering please state the number and date of the patent desired.

New Patents—Great Britain—February and March, 1882.

1132. Improved method or means of applying earthenware tubes and pipes for the conveyance of gas, water, telegraph wires, &c. G. Smith. Dated March 8.

1136. Electric Telegraphs. S. Pitt. (Communicated by H. C Mance.) Dated March 8.

1137. Telegraphic apparatus, especially for street fire-alarms. W. H. Davies and F. H. W. Higgins. Dated March 8.

1139. Dynamo or magneto-electric machines or electric engines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 9.

1142. Means for regulating the generative capacity of dynamo or magneto-electric machines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 9.

1153. Improved substitute for gutta-percha for insulating waterproofing, and other purposes M Zingler. Dated March 9.

1162. Apparatus for the distribution and regulation of electric currents. W. R. Lake. (Communicated by H. S. Maxim.) Dated March 10.

1163. Electric lighting apparatus. W. R. Lake. (Communicated by E. Weston.) Dated March 10.

1171. Mechanism for regulating the burning of carbon or other electrodes in electric lighting apparatus. A. Graham. Dated March 10.

1172. Improvements in incandescence electric lamps and in apparatus employed in the manufacture of the carbon filaments. J. Wanthier. Dated March 10.

1173. Secondary batteries or electric accumulators. J. H. Johnson. (Communicated by A. de Méritens.) Dated March 10.

1174. Generating, distribution, storing, utilization, measuring, and regulation of electricity, and apparatus or means therefor. J. S. Williams. Dated March 10.

1177. Telephones. J. D. Husbands. Dated March 10.

1191. Improvements relating to dynamo or magneto-electric machines for regulating the generative capacity of such machines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 11.

1195. Improvements in relation to electric circuits and in apparatus for protecting buildings, safes, vaults and other structures from burglars. W. P. Thompson. (Communicated by M. H. Kerner.) Dated March 11.

1199. A new and improved electric lamp of the arc type. R. Kennedy. Dated March 13.

1201. Construction of dynamo-electric or magneto-electric and electro-dynamic machines. R. Matthews. Dated March 13.

1207. Apparatus for giving alarm in case of accidents, burglarious attempts, fires, or other like matters. C. B. Wood. Dated March 13.

1211. Machinery for obtaining electric currents. H. E. Newton. (Communicated by A. J. Gravier.) Dated March 13.

1221. An improved method of, and apparatus for transmitting and receiving telegraphic messages or signals. H. H. Lake, (Communicated by A. L. Parcelle.) Dated March 14.

1225. Apparatus for gauging carbon filaments, wire, or other articles. M. Evans. Dated March 14.

1249. Improvements in armatures for magneto-electric machines, and in apparatus for developing electric light. C. L. Levey and E. Lumley. Dated March 15.

1254. An improved telegraph relay. J. Ebel. Dated March 15.

1271. Telephones. A. W. Rose. Dated March 16.

1274, Incandescent electric lamps. F. Wright and M. W. W. Mackie. Dated March 16.

1288. Improvements in incandescent lamps and in fittings and switches for electric light apparatus J. B. Rogers. Dated March 16.

1302. An improved electrolier. Hon. R. Brougham. Dated March 17.

1303. Telegraphic and telephonic systems and apparatus therefore. P. M. Justice. (Communicated by F. Van Rysselberghe.) Dated March 17.

1324. Electric lamps. J. D. F. Andrews. Dated March 18.

1327. Improvements in means or apparatus to be used in connection with the transmission of electric currents of high tension. L. J. Crossley, J. F. Harrison, and Wm. Emmott. Dated March 18.

1328. Improvements in electric signalling apparatus, applicable also to other purposes. L. J. Crossley, J. F. Harrison and W. Emmott. Dated March 18.

1336. Improvements in the manufacture of covered or insulated wire, and in apparatus or machinery therefor. A. J. Boult. (Communicated by J. D. Thomas and L. F. Requa.) Dated March 18.

1345. Joining together or coupling lengths of telegraph wire, signalling wire, &c D. Bremner. Dated March 20.

1347. An improved machine for generating electric currents, applicable also as an electro-motor. S. E. Phillips. (Partly communicated by W. C. Johnson.) Dated March 20.

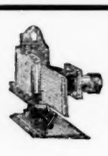
1356. Telephones R. and M. Theiler. Dated March 21.

1363. Secondary Batteries. F. Maxwell-Lyte Dated March 21.

1366. An improved method of, and means for, working telephonic and telegraphic apparatus. A. E. Dolbear. Dated March 21.

1367. An improved method of, and means for, providing ground or earth connections for electrical circuits. A. E. Dolbear. Dated March 21.

1368. Electrical cables. A. E. Dolbear. Dated March 21.



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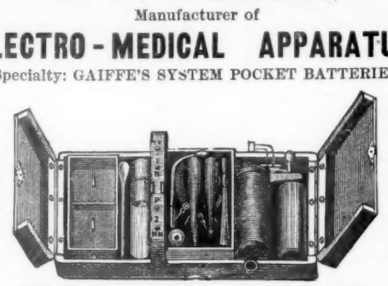
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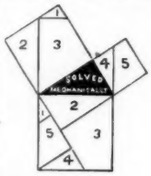

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